#10/a

SEQUENCE LISTING

<110> Lowery E., David
Fuller E., Troy
Kennedy J., Michael

<120> Anti-Bacterial Vaccine Compositions

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<140> 09/545,199
<141> 2000-04-06

<150> 60/153,453
<151> 1999-09-10

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ttttcataaa tatcaataaa ggattagtt atg gca gca gag ctt aca aca gcg 233
Met Ala Ala Glu Leu Thr Thr Ala
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gga tat att ggg cac cat tta gca ttc ttg aaa aca ggg gat tct ttc 281
Gly Tyr Ile Gly His His Leu Ala Phe Leu Lys Thr Gly Asp Ser Phe
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Trp His Val His Leu Asp Thr Leu Leu Phe Ser Ile Ile Ser Gly Ala
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Ile Phe Leu Phe Val Phe Ser Lys Val Ala Lys Lys Ala Thr Pro Gly
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gtg cct agc aag atg caa tgt ttt gtt gag ata atg gtt gat tgg att   425
Val Pro Ser Lys Met Gln Cys Phe Val Glu Ile Met Val Asp Trp Ile
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gat ggg atc gta aaa gaa aat ttc cat ggt cct cgt cat gct gtt gga   473
Asp Gly Ile Val Lys Glu Asn Phe His Gly Pro Arg His Ala Val Gly
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cca tta gca tta act att ttc tgc tgg gta ttc att atg aat gct atc   521
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gat ttg atc cca gta gat ttc cta cct caa tta gcc cat tta ttt ggt   569
Asp Leu Ile Pro Val Asp Phe Leu Pro Gln Leu Ala His Leu Phe Gly
105                 110                 115                 120

att gaa tac tta aga gct gtt cca aca gca gat atc agt gga aca tta   617
Ile Glu Tyr Leu Arg Ala Val Pro Thr Ala Asp Ile Ser Gly Thr Leu
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ggc tta tca att ggt gtc ttc ttc tta att att ttc tat aca atc aaa   665
Gly Leu Ser Ile Gly Val Phe Phe Leu Ile Ile Phe Tyr Thr Ile Lys
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tca aaa ggt atg agt ggc ttt gtt aaa gaa tat acg ctt cat cct ttt   713
Ser Lys Gly Met Ser Gly Phe Val Lys Glu Tyr Thr Leu His Pro Phe
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aat cat cct ttg tta att ccg gtt aac tta gcg ctt gaa tca gtc aca   761
Asn His Pro Leu Leu Ile Pro Val Asn Leu Ala Leu Glu Ser Val Thr
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Leu Leu Ala Lys Pro Val Ser Leu Ala Phe Arg Leu Phe Gly Asn Met
185                 190                 195                 200

tat gca ggt gaa ctt atc ttt att ctt att gca gtg atg tac atg gca   857
Tyr Ala Gly Glu Leu Ile Phe Ile Leu Ile Ala Val Met Tyr Met Ala
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aat aat ttt gca ctt aat tca atg ggt att ttc atg cat ttg gct tgg   905
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gct att ttc cat att ctt gtg att acc tta caa gca ttt att ttt atg   953
Ala Ile Phe His Ile Leu Val Ile Thr Leu Gln Ala Phe Ile Phe Met
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atg ctt aca gtg gtt tat ttg agt atg ggt tat aac aaa gca gaa cac   1001
Met Leu Thr Val Val Tyr Leu Ser Met Gly Tyr Asn Lys Ala Glu His
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Val Glu Ile Met Val Asp Trp Ile Asp Gly Ile Val Lys Glu Asn Phe
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His Gly Pro Arg His Ala Val Gly Pro Leu Ala Leu Thr Ile Phe Cys
85 90 95

Trp Val Phe Ile Met Asn Ala Ile Asp Leu Ile Pro Val Asp Phe Leu
100 105 110

Pro Gln Leu Ala His Leu Phe Gly Ile Glu Tyr Leu Arg Ala Val Pro
115 120 125

Thr Ala Asp Ile Ser Gly Thr Leu Gly Leu Ser Ile Gly Val Phe Phe
130 135 140

Leu Ile Ile Phe Tyr Thr Ile Lys Ser Lys Gly Met Ser Gly Phe Val
145 150 155 160

Lys Glu Tyr Thr Leu His Pro Phe Asn His Pro Leu Leu Ile Pro Val
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195 200 205

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210 215 220

Gly Ile Phe Met His Leu Ala Trp Ala Ile Phe His Ile Leu Val Ile
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tatgcgtgag ttaacccaat ctggcaatta caatgatgaa attaaagagt cattaaaagg 300

cattttggat agcttcaaag caaacagtgc gtggtaagtt aacactttaa atggagagac 360

aaa atg gca ggt gct aaa gag ata aga acc aaa atc gcg agt gta aaa 408
Met Ala Gly Ala Lys Glu Ile Arg Thr Lys Ile Ala Ser Val Lys
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agt aca caa aaa att act aaa gcg atg gaa atg gtt gct gcc tcg aaa 456
Ser Thr Gln Lys Ile Thr Lys Ala Met Glu Met Val Ala Ala Ser Lys
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Met Arg Lys Thr Gln Glu Arg Met Ser Ser Ser Arg Pro Tyr Ser Glu
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Thr Ile Arg Asn Val Ile Ser His Val Ser Lys Ala Thr Ile Gly Tyr
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Lys His Pro Phe Leu Val Asp Arg Glu Val Lys Lys Val Gly Met Ile
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Val Val Ser Thr Asp Arg Gly Leu Cys Gly Gly Leu Asn Val Asn Leu
80 85 90 95

ttt aaa act gta tta aat gaa atg aaa gaa tgg aaa gaa aaa gat gtt 696
Phe Lys Thr Val Leu Asn Glu Met Lys Glu Trp Lys Glu Lys Asp Val
100 105 110

tcc gtt caa ttg agt tta atc ggt tct aaa tct atc aac ttt ttc caa 744
Ser Val Gln Leu Ser Leu Ile Gly Ser Lys Ser Ile Asn Phe Phe Gln
115 120 125

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Ser Leu Gly Ile Lys Ile Leu Thr Gln Asp Ser Gly Ile Gly Asp Thr
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ccc tct gtt gag cag tta att ggt tca gtc aat tct atg att gat gct 840
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tat att tac gaa cct gat gcg aaa gta tta tta gat aat tta ttg gtt   1032
Tyr Ile Tyr Glu Pro Asp Ala Lys Val Leu Leu Asp Asn Leu Leu Val
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cgt tat tta gaa tct cag gtt tat caa gca gca gtt gaa aac ctt gct   1080
Arg Tyr Leu Glu Ser Gln Val Tyr Gln Ala Ala Val Glu Asn Leu Ala
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tct gag caa gcc gct cga atg gtc gcc atg aaa gca gca aca gat aac   1128
Ser Glu Gln Ala Ala Arg Met Val Ala Met Lys Ala Ala Thr Asp Asn
240                 245                 250                 255

gca ggt aac tta att aat gag tta cag tta gtc tat aac aaa gct cgt   1176
Ala Gly Asn Leu Ile Asn Glu Leu Gln Leu Val Tyr Asn Lys Ala Arg
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caa gca agt att aca aat gaa tta aat gaa att gtt gcc ggt gca gca   1224
Gln Ala Ser Ile Thr Asn Glu Leu Asn Glu Ile Val Ala Gly Ala Ala
            275                 280                 285

gca att taacaaatag aggatcggta atggcaactg gaaaaattgt acaaatcatc   1280
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Arg Lys Thr Gln Glu Arg Met Ser Ser Ser Arg Pro Tyr Ser Glu Thr
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Ile Arg Asn Val Ile Ser His Val Ser Lys Ala Thr Ile Gly Tyr Lys
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His Pro Phe Leu Val Asp Arg Glu Val Lys Lys Val Gly Met Ile Val
65                  70                  75                  80

Val Ser Thr Asp Arg Gly Leu Cys Gly Gly Leu Asn Val Asn Leu Phe
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Lys Thr Val Leu Asn Glu Met Lys Glu Trp Lys Glu Lys Asp Val Ser
            100                 105                 110

Val Gln Leu Ser Leu Ile Gly Ser Lys Ser Ile Asn Phe Phe Gln Ser
        115                 120                 125

Leu Gly Ile Lys Ile Leu Thr Gln Asp Ser Gly Ile Gly Asp Thr Pro
    130                 135                 140

Ser Val Glu Gln Leu Ile Gly Ser Val Asn Ser Met Ile Asp Ala Tyr
145                 150                 155                 160

Lys Lys Gly Glu Val Asp Val Val Tyr Leu Val Tyr Asn Lys Phe Ile
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Asn Thr Met Ser Gln Lys Pro Val Leu Glu Lys Leu Ile Pro Leu Pro
            180                 185                 190

Glu Leu Asp Asn Asp Glu Leu Gly Glu Arg Lys Gln Val Trp Asp Tyr
        195                 200                 205

Ile Tyr Glu Pro Asp Ala Lys Val Leu Leu Asp Asn Leu Leu Val Arg
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Tyr Leu Glu Ser Gln Val Tyr Gln Ala Ala Val Glu Asn Leu Ala Ser
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Glu Gln Ala Ala Arg Met Val Ala Met Lys Ala Ala Thr Asp Asn Ala
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Gly Asn Leu Ile Asn Glu Leu Gln Leu Val Tyr Asn Lys Ala Arg Gln
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Glu Phe Tyr Pro Leu Glu Ala Val Lys Thr Asn Ile Leu Gly Thr Ala
            20                  25                  30

aat gtc tta gaa gcc gcc atc caa aac cag ata aaa cgc gtc gtc tgt   144
Asn Val Leu Glu Ala Ala Ile Gln Asn Gln Ile Lys Arg Val Val Cys
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ctt agc aca gat aaa gcg gtg tac cca att aat gcg atg ggc att tct   192
Leu Ser Thr Asp Lys Ala Val Tyr Pro Ile Asn Ala Met Gly Ile Ser
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aaa gca atg atg gaa aaa gtc atc atc gca aaa tcg cgt aac cta gaa   240
Lys Ala Met Met Glu Lys Val Ile Ile Ala Lys Ser Arg Asn Leu Glu
 65                  70                  75                  80

ggc aca cca acg aca atc tgt tgt act cgc tat ggc aat gtc atg gca   288
Gly Thr Pro Thr Thr Ile Cys Cys Thr Arg Tyr Gly Asn Val Met Ala
                85                  90                  95

tcg cgt ggt tcg gtt atc cca tta ttt gtc gat caa ata cgt caa ggc   336
Ser Arg Gly Ser Val Ile Pro Leu Phe Val Asp Gln Ile Arg Gln Gly
            100                 105                 110

aag cct ttt act att act gat cct gag atg aca cgc ttt atg atg aca   384
Lys Pro Phe Thr Ile Thr Asp Pro Glu Met Thr Arg Phe Met Met Thr
        115                 120                 125

ttg gaa gat gct gtg gat tta gtc cta tat gca ttt aaa aat ggt caa   432
Leu Glu Asp Ala Val Asp Leu Val Leu Tyr Ala Phe Lys Asn Gly Gln
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aat ggt gat gtt ttt gta caa aaa gcc ccc gca gca acc att ggt acc   480
Asn Gly Asp Val Phe Val Gln Lys Ala Pro Ala Ala Thr Ile Gly Thr
145                 150                 155                 160

ctt gcc aaa gca att acc gaa tta tta tct gtc cca aat cac cct att   528
Leu Ala Lys Ala Ile Thr Glu Leu Leu Ser Val Pro Asn His Pro Ile
                165                 170                 175

tcc att ata ggt acg cgt cat gga gag aaa gca ttc gaa gct tta tta   576
Ser Ile Ile Gly Thr Arg His Gly Glu Lys Ala Phe Glu Ala Leu Leu
            180                 185                 190

agc cgt gaa gaa atg gtt cat gca att aat gaa ggt aat tat tat cgc   624
Ser Arg Glu Glu Met Val His Ala Ile Asn Glu Gly Asn Tyr Tyr Arg
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ggg gaa cca aaa att acc gaa gtc acc gac tac aac tca cat aat act   720
Gly Glu Pro Lys Ile Thr Glu Val Thr Asp Tyr Asn Ser His Asn Thr
225                 230                 235                 240

gag cgt ttg act gtc aag gaa atg aag cag tta ctg ctt aaa ctt gaa   768
Glu Arg Leu Thr Val Lys Glu Met Lys Gln Leu Leu Leu Lys Leu Glu
                245                 250                 255

ttc ata cag aaa atg att gag ggt gaa tac atc tca ccg gag gta       813
Phe Ile Gln Lys Met Ile Glu Gly Glu Tyr Ile Ser Pro Glu Val
            260                 265                 270

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Asn Val Leu Glu Ala Ala Ile Gln Asn Gln Ile Lys Arg Val Val Cys
         35                  40                  45

Leu Ser Thr Asp Lys Ala Val Tyr Pro Ile Asn Ala Met Gly Ile Ser
     50                  55                  60

Lys Ala Met Met Glu Lys Val Ile Ile Ala Lys Ser Arg Asn Leu Glu
 65                  70                  75                  80

Gly Thr Pro Thr Thr Ile Cys Cys Thr Arg Tyr Gly Asn Val Met Ala
                 85                  90                  95
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Ser Arg Gly Ser Val Ile Pro Leu Phe Val Asp Gln Ile Arg Gln Gly
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Lys Pro Phe Thr Ile Thr Asp Pro Glu Met Thr Arg Phe Met Met Thr
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Leu Glu Asp Ala Val Asp Leu Val Leu Tyr Ala Phe Lys Asn Gly Gln
    130                 135                 140

Asn Gly Asp Val Phe Val Gln Lys Ala Pro Ala Ala Thr Ile Gly Thr
145                 150                 155                 160

Leu Ala Lys Ala Ile Thr Glu Leu Leu Ser Val Pro Asn His Pro Ile
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Ser Ile Ile Gly Thr Arg His Gly Glu Lys Ala Phe Glu Ala Leu Leu
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Ser Arg Glu Glu Met Val His Ala Ile Asn Glu Gly Asn Tyr Tyr Arg
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Ile Pro Ala Asp Gln Arg Ser Leu Asn Tyr Ser Lys Tyr Val Glu Lys
    210                 215                 220

Gly Glu Pro Lys Ile Thr Glu Val Thr Asp Tyr Asn Ser His Asn Thr
225                 230                 235                 240

Glu Arg Leu Thr Val Lys Glu Met Lys Gln Leu Leu Leu Lys Leu Glu
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aaggaaagat c atg aat aca atc att ttt gac agt gca cag cat gcc gta  4070
            Met Asn Thr Ile Ile Phe Asp Ser Ala Gln His Ala Val
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gag aaa att gca caa gaa ttg tta gcg tat agc tta gaa ggt cgc cct   4118
Glu Lys Ile Ala Gln Glu Leu Leu Ala Tyr Ser Leu Glu Gly Arg Pro
     15                  20                  25

gtg cat att tcc tta tcc gga ggc tca acg ccg aaa ttg tta ttt aaa   4166
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Val His Ile Ser Leu Ser Gly Gly Ser Thr Pro Lys Leu Leu Phe Lys
 30                  35                  40                  45

act tta gct caa gca ccg tat aac acc gag att caa tgg aaa aat ttg   4214
Thr Leu Ala Gln Ala Pro Tyr Asn Thr Glu Ile Gln Trp Lys Asn Leu
                 50                  55                  60

cat ttt tgg tgg ggc gat gat cgt atg gtg cca cca acc gat cca gaa   4262
His Phe Trp Trp Gly Asp Asp Arg Met Val Pro Pro Thr Asp Pro Glu
             65                  70                  75

agt aat tac ggc gag gtg caa aaa ttg tta ttc gat cat att cag atc   4310
Ser Asn Tyr Gly Glu Val Gln Lys Leu Leu Phe Asp His Ile Gln Ile
         80                  85                  90

cct gca gaa aat att cac cgc att cgt ggt gaa gcc ccc gtt gag agt   4358
Pro Ala Glu Asn Ile His Arg Ile Arg Gly Glu Ala Pro Val Glu Ser
     95                 100                 105

gaa ctt cac cgt ttt gaa caa gcg cta agt gcg gtc att cct ggg caa   4406
Glu Leu His Arg Phe Glu Gln Ala Leu Ser Ala Val Ile Pro Gly Gln
110                 115                 120                 125

gtt ttt gat tgg att att ttg ggc atg gga acg gac ggg cac acg gcc   4454
Val Phe Asp Trp Ile Ile Leu Gly Met Gly Thr Asp Gly His Thr Ala
                130                 135                 140

tca tta ttc ccg cat caa acc gat ttt gac gat cct cat ttc gcc gtg   4502
Ser Leu Phe Pro His Gln Thr Asp Phe Asp Asp Pro His Phe Ala Val
            145                 150                 155

atc gcg aaa cac cct gaa aca ggg caa att cgt att tca aaa aca gcg   4550
Ile Ala Lys His Pro Glu Thr Gly Gln Ile Arg Ile Ser Lys Thr Ala
        160                 165                 170

aaa ttg att gaa caa gca aag cgg gtg acc tat ttg gtg aca ggt agc   4598
Lys Leu Ile Glu Gln Ala Lys Arg Val Thr Tyr Leu Val Thr Gly Ser
    175                 180                 185

agt aaa gcc gag atc tta aaa gaa att caa act act ccg gca gaa caa   4646
Ser Lys Ala Glu Ile Leu Lys Glu Ile Gln Thr Thr Pro Ala Glu Gln
190                 195                 200                 205

ctg cct tat cct gct gcg aaa atc aaa gcg aag cat ggg gtg acg gaa   4694
Leu Pro Tyr Pro Ala Ala Lys Ile Lys Ala Lys His Gly Val Thr Glu
                210                 215                 220

tgg tat ttg gat aag gat gcg gca aaa tta ctg taatgcgtcg tgagattttt 4747
Trp Tyr Leu Asp Lys Asp Ala Ala Lys Leu Leu
            225                 230

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ctgaaaatga aggctctcgt tgaaaatggc gccatttagt gggtaagctt aaggttcgct 4867

cagacagcgc tatcaaaagg gtaaaagaat gtatcaactc tattttaatc caccaaaatc 4927

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aattgtacgt tatttggatg atttaagtga acaacgccaa caatttaagg cgttttcgcc 5047

gacttcaaaa atcccagtat tgcatgctga tggtgttgtc atttgggaca gtttagcgat 5107
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<213> Pasteurella multocida

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Ala Gln Glu Leu Leu Ala Tyr Ser Leu Glu Gly Arg Pro Val His Ile
            20                  25                  30

Ser Leu Ser Gly Gly Ser Thr Pro Lys Leu Leu Phe Lys Thr Leu Ala
        35                  40                  45

Gln Ala Pro Tyr Asn Thr Glu Ile Gln Trp Lys Asn Leu His Phe Trp
    50                  55                  60

Trp Gly Asp Asp Arg Met Val Pro Pro Thr Asp Pro Glu Ser Asn Tyr
65                  70                  75                  80

Gly Glu Val Gln Lys Leu Leu Phe Asp His Ile Gln Ile Pro Ala Glu
                85                  90                  95

Asn Ile His Arg Ile Arg Gly Glu Ala Pro Val Glu Ser Glu Leu His
            100                 105                 110
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Arg Phe Glu Gln Ala Leu Ser Ala Val Ile Pro Gly Gln Val Phe Asp
        115                 120                 125

Trp Ile Ile Leu Gly Met Gly Thr Asp Gly His Thr Ala Ser Leu Phe
    130                 135                 140

Pro His Gln Thr Asp Phe Asp Asp Pro His Phe Ala Val Ile Ala Lys
145                 150                 155                 160

His Pro Glu Thr Gly Gln Ile Arg Ile Ser Lys Thr Ala Lys Leu Ile
                165                 170                 175

Glu Gln Ala Lys Arg Val Thr Tyr Leu Val Thr Gly Ser Ser Lys Ala
            180                 185                 190

Glu Ile Leu Lys Glu Ile Gln Thr Thr Pro Ala Glu Gln Leu Pro Tyr
        195                 200                 205

Pro Ala Ala Lys Ile Lys Ala Lys His Gly Val Thr Glu Trp Tyr Leu
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Asp Lys Asp Ala Ala Lys Leu Leu
225                 230
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gaagctgcgc accctgatat cgaattatat accgcatcag ttgatagtca cttaaatgaa 180

caaggctata ttattccagg tcttggtgat gccggtgata aaatttttgg cactaaataa 240

tcccaacaca agcggcatct tatgccgctt ttttccgttc aatttatagc gcttacaatc 300

ttaacagctt gaacactata aaatgaaaag ttaattcaga cagagagttg aaacttaaca 360

tgacaaatca aaatcccccc gttcttctag aacaaaatca cgcaaaacaa gccttcgttg 420

ggctacaaat gctttttgtt gccttcggtg ctttagtcct tgttcccctg attacgggtt 480

taaatgccaa tactgcctta ttgaccgcag ggattgggac actcttattc caactttgta 540

ctggacgcca agtcccaatt ttcttagcct cttcctttgc ttttattgca ccaattcaat 600

atggcgtggc aacatggggc attgctacta ctatgggggg gctggtgttt actggactgg 660

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ttccgccagt agttgttggt cccgttatta tcatcatcgg tatgggactt gcccctgttg 780

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tcaacttaat cttacccaaa gccaaaaaca ccccaataga agaaaatcga taagagaaaa 1620

ttaagggtta agtc ttg ctt aac cct tca ttt ttc gtt tat cct tat tct   1670
               Leu Leu Asn Pro Ser Phe Phe Val Tyr Pro Tyr Ser
                 1               5                  10

cct ttt ttc gat ttt gta ggt tgc ttt ttg tta gaa aat ttc caa tta   1718
Pro Phe Phe Asp Phe Val Gly Cys Phe Leu Leu Glu Asn Phe Gln Leu
         15                  20                  25


cct ttg cct att cat caa ctc gat gat gaa acg ctg gat aat ttc tat   1766
Pro Leu Pro Ile His Gln Leu Asp Asp Glu Thr Leu Asp Asn Phe Tyr
     30                  35                  40

ccc gac aat aat tta ttg ttg ctc aat tcg cta cgc aaa aat ttt act   1814
Pro Asp Asn Asn Leu Leu Leu Leu Asn Ser Leu Arg Lys Asn Phe Thr
 45                  50                  55                  60

tgt cta aca caa caa ttt ttt tat att tgg ggc gag caa agc agt ggt   1862
Cys Leu Thr Gln Gln Phe Phe Tyr Ile Trp Gly Glu Gln Ser Ser Gly
                 65                  70                  75

aaa agt cac ctc tta aaa ggc att act cat cat ttt ttc ctt tta cag   1910
Lys Ser His Leu Leu Lys Gly Ile Thr His His Phe Phe Leu Leu Gln
             80                  85                  90

cgc ccc gct atc tat gtg ccc tta gaa aaa tcc caa tat ttc tca ccg   1958
Arg Pro Ala Ile Tyr Val Pro Leu Glu Lys Ser Gln Tyr Phe Ser Pro
         95                  100                 105

gcg gta ctc gaa aac tta gaa caa caa caa ttg gtt tgt tta gat aat   2006
Ala Val Leu Glu Asn Leu Glu Gln Gln Gln Leu Val Cys Leu Asp Asn
    110                 115                 120

tta cag gca att ata ggc aat act gaa tgg gaa tta gcg att ttt gat   2054
Leu Gln Ala Ile Ile Gly Asn Thr Glu Trp Glu Leu Ala Ile Phe Asp
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125                 130                 135                 140

tta ttt aat cgc ata aaa tct gtt gaa aat aca ctg ctt gtg atc agt   2102
Leu Phe Asn Arg Ile Lys Ser Val Glu Asn Thr Leu Leu Val Ile Ser
                145                 150                 155

gca aat caa tcc cca act gca tta cct gta agt tta cct gac tta gct   2150
Ala Asn Gln Ser Pro Thr Ala Leu Pro Val Ser Leu Pro Asp Leu Ala
            160                 165                 170

tca cgt tta cgc tgg gga gaa agc tat cag ctg gtc ccc tta aat gat   2198
Ser Arg Leu Arg Trp Gly Glu Ser Tyr Gln Leu Val Pro Leu Asn Asp
        175                 180                 185

caa caa aaa atc cat gta ttg caa aaa aat gca cat caa cgt ggt atc   2246
Gln Gln Lys Ile His Val Leu Gln Lys Asn Ala His Gln Arg Gly Ile
    190                 195                 200

gaa ctc ccc gat gaa gta gct aat ttt ctt ttg aaa cgc tta gag cgc   2294
Glu Leu Pro Asp Glu Val Ala Asn Phe Leu Leu Lys Arg Leu Glu Arg
205                 210                 215                 220

gat atg aaa acg tta ttt gaa gca cta agt aaa tta gat aaa gca tca   2342
Asp Met Lys Thr Leu Phe Glu Ala Leu Ser Lys Leu Asp Lys Ala Ser
                225                 230                 235

tta caa gcc caa cgt aaa tta acg att ccc ttt gta aaa gaa att tta   2390
Leu Gln Ala Gln Arg Lys Leu Thr Ile Pro Phe Val Lys Glu Ile Leu
            240                 245                 250

aag cta taaaaaaaga ccacctcttt atcaggtgat ctttcttgtc ga           2438
Lys Leu
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<213> Pasteurella multocida

<400> 10

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Phe Val Gly Cys Phe Leu Leu Glu Asn Phe Gln Leu Pro Leu Pro Ile
             20                  25                  30

His Gln Leu Asp Asp Glu Thr Leu Asp Asn Phe Tyr Pro Asp Asn Asn
         35                  40                  45

Leu Leu Leu Leu Asn Ser Leu Arg Lys Asn Phe Thr Cys Leu Thr Gln
     50                  55                  60

Gln Phe Phe Tyr Ile Trp Gly Glu Gln Ser Ser Gly Lys Ser His Leu
 65                  70                  75                  80

Leu Lys Gly Ile Thr His His Phe Phe Leu Leu Gln Arg Pro Ala Ile
                 85                  90                  95

Tyr Val Pro Leu Glu Lys Ser Gln Tyr Phe Ser Pro Ala Val Leu Glu
            100                 105                 110

Asn Leu Glu Gln Gln Gln Leu Val Cys Leu Asp Asn Leu Gln Ala Ile
        115                 120                 125
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Ile Gly Asn Thr Glu Trp Glu Leu Ala Ile Phe Asp Leu Phe Asn Arg
    130                 135                 140

Ile Lys Ser Val Glu Asn Thr Leu Leu Val Ile Ser Ala Asn Gln Ser
145                 150                 155                 160

Pro Thr Ala Leu Pro Val Ser Leu Pro Asp Leu Ala Ser Arg Leu Arg
                165                 170                 175

Trp Gly Glu Ser Tyr Gln Leu Val Pro Leu Asn Asp Gln Gln Lys Ile
            180                 185                 190

His Val Leu Gln Lys Asn Ala His Gln Arg Gly Ile Glu Leu Pro Asp
        195                 200                 205

Glu Val Ala Asn Phe Leu Leu Lys Arg Leu Glu Arg Asp Met Lys Thr
    210                 215                 220

Leu Phe Glu Ala Leu Ser Lys Leu Asp Lys Ala Ser Leu Gln Ala Gln
225                 230                 235                 240

Arg Lys Leu Thr Ile Pro Phe Val Lys Glu Ile Leu Lys Leu
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tggggcatct tggcaaagtt tgatcgcaat aatcaacaaa aaatgtcacg acaagatcgt 180

ttgaaacttt ttgtgcaagc tttaattggt atttggttgg ttgttggact cgcattccat 240

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atggcattgc cttataccat cgtattatcc tgtattggtt tattgactgt ggaatatatt 780

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gtaaaaggag gaaac atg cta agc ttt ttt aag aca ctc tca aca aaa cga  891
                Met Leu Ser Phe Phe Lys Thr Leu Ser Thr Lys Arg
                  1               5                  10

agt gca tgg ttt cta ttg ttt agc tca gct tta cta tta gag gct atc   939
Ser Ala Trp Phe Leu Leu Phe Ser Ser Ala Leu Leu Leu Glu Ala Ile
         15                  20                  25

gct ctt tat ttt caa cat ggc atg ggg ctc gcc cct tgt gtc atg tgt   987
Ala Leu Tyr Phe Gln His Gly Met Gly Leu Ala Pro Cys Val Met Cys
     30                  35                  40

att tac gag agg gta gct att ctt ggc att gct ttc tcc ggt tta ttg  1035
Ile Tyr Glu Arg Val Ala Ile Leu Gly Ile Ala Phe Ser Gly Leu Leu
 45                  50                  55                  60

ggg tta ctc tac ccg agt tcg atg ctt ttg cgc ctt gtg gcg tta tta  1083
Gly Leu Leu Tyr Pro Ser Ser Met Leu Leu Arg Leu Val Ala Leu Leu
                 65                  70                  75

att ggt tta agc agt gca atc aaa ggc tta atg att agc atc acc cat  1131
Ile Gly Leu Ser Ser Ala Ile Lys Gly Leu Met Ile Ser Ile Thr His
             80                  85                  90

tta gat cta caa ctt tac cct gca cct tgg aaa caa tgt tca gcg gtg  1179
Leu Asp Leu Gln Leu Tyr Pro Ala Pro Trp Lys Gln Cys Ser Ala Val
         95                  100                 105

gca gaa ttt ccc gag act tta ccc tta gat cag tgg ttt cct gca ctc  1227
Ala Glu Phe Pro Glu Thr Leu Pro Leu Asp Gln Trp Phe Pro Ala Leu
    110                 115                 120

ttc ctc cct tca ggc tca tgc agt gaa gta aca tgg caa ttt ctc ggc  1275
Phe Leu Pro Ser Gly Ser Cys Ser Glu Val Thr Trp Gln Phe Leu Gly
125                 130                 135                 140

ttt tct atg gtg caa tgg atc gtc gtc att ttt gca ctc tat acc tta  1323
Phe Ser Met Val Gln Trp Ile Val Val Ile Phe Ala Leu Tyr Thr Leu
                145                 150                 155

tta ctt gct ctc att ttc atc agc caa gtc aaa cgt cta aaa ccc aag  1371
Leu Leu Ala Leu Ile Phe Ile Ser Gln Val Lys Arg Leu Lys Pro Lys
            160                 165                 170

cag cgc aga ctc ttt cat taagtcataa aaaatggtgc gataaagcac        1419
Gln Arg Arg Leu Phe His
        175

cattttcat ttctcgttcg gtatagatta aatttcttgc acgacaaact gcagggaatg 1479

tcttgctaat aatcttgctt tacgctgctt taagcgtttt aaacgtaatg cgcgtccttg 1539

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catagcctcg cgcatacccg tattttaacc ccgtgtaata gcgtttttct gctaatagtg 1839
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gctcatcttc tttaatcgta tcaggcattt gcgtaataag ccaatgtaaa tattctgaac 2019

cggctttaat actttgttcc ggatccgttc tgtcttgaat t 2060

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<213> Pasteurella multocida

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Gln His Gly Met Gly Leu Ala Pro Cys Val Met Cys Ile Tyr Glu Arg
35 40 45

Val Ala Ile Leu Gly Ile Ala Phe Ser Gly Leu Leu Gly Leu Leu Tyr
50 55 60

Pro Ser Ser Met Leu Leu Arg Leu Val Ala Leu Leu Ile Gly Leu Ser
65 70 75 80

Ser Ala Ile Lys Gly Leu Met Ile Ser Ile Thr His Leu Asp Leu Gln
85 90 95

Leu Tyr Pro Ala Pro Trp Lys Gln Cys Ser Ala Val Ala Glu Phe Pro
100 105 110

Glu Thr Leu Pro Leu Asp Gln Trp Phe Pro Ala Leu Phe Leu Pro Ser
115 120 125

Gly Ser Cys Ser Glu Val Thr Trp Gln Phe Leu Gly Phe Ser Met Val
130 135 140

Gln Trp Ile Val Val Ile Phe Ala Leu Tyr Thr Leu Leu Leu Ala Leu
145 150 155 160

Ile Phe Ile Ser Gln Val Lys Arg Leu Lys Pro Lys Gln Arg Arg Leu
165 170 175

Phe His

<210> 13
<211> 4426
<212> DNA
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<220>
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gacttcacgt agcgtttcct taatattgtc atcagttaaa cgtccacgtc cactaatgtt 180

acgtagcgtt tttgacaagc gatccgacaa attctcaaac atgcaatctt cctatttaat 240

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ttatagcgat ttcacagtga gaaagttaga atggacggag aacaaaggtg agggaatttc 360

aatgtggctt tcaatttttt ccgtgttttt ttatctattg agtgtcttac tcattacccc 420

tatgttgtta aaaattcaag cgggcgaacc cgcatcggtt cccaatagga tgccttttt 480

aacggcagca ttactcgcca ttcttctgca ctttatcaat cttattcctc tttttaccga 540

tttaaccagc ggtcaaaatt tctcggttat cgaaatcagt tccttaatca gtgttatgac 600

agcaacgatc gccacattag cgtttttatt tcgcatacac actttatggt ttttattacc 660

gattatttat tctttcgcca tcattaatct ggtcctcagt accttaatgc cggcgcattt 720

tttatatcat cttaatcaag atatgggctt atttattcat gtaggcttat cactgttgac 780

ttattcggtc tgttcgattg tcgcgttata ttccattcag ttagtttgga tcgatcgcgc 840

cttaaaaaat aaaaaactgc ctttttcacc aatgattcca ccgttaatga ccgtagagcg 900

ccatttttt cgtttaatgc tgataggtga aatattactc acgattgtcc tcatttcagg 960

gagctaccat ttatcgaaaa cctttgcccc acaagacatc cagaaagctg ttttttcttt 1020

cttggcttgg atagtctttg ggagtgcact ggttggtcat tggaagctcc attggcgtgg 1080

aaaaaaagtg gtgtattatg cgcttttagg tatcattctc ctgactatcg cctattttgg 1140

tagtcgtgta atgcttgaaa tataaacaag atttatttat gctacgccat agtaaaagtg 1200

cggttcaaaa aacgaaaaaa tgaccgcact tttcgatttt tgattaactc gcaaaaggat 1260

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ccattaccac gattatcggc atgcgcttat atggcgatgc gggagtcgcc attgcaactg 1560

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gttatccaga aaaagtggca ttcacgtcca gtcatttgtt gtccgttttt ctgcgacttt 1680

ttaccccgct ggtctattta atgaatttaa ttattcaggg gattttggca ctattacgtc 1740

taaaatcaga taataaatca acctcattaa gcccagagga attacgttcc atcgtaaatg 1800

aatcaggtaa atttattcct tccgcccacc aagaaatgct gttatctatt ttggatttag 1860

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aaggggtcac cgtagatgac attatggtgc cacgtaatga cattgggggt attgatattg 1920

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tgtataaagg aaatatggat gaaaatattt tggggatgtt acgtgtacgt gaagcctatc 2040

gcttaatgct cgataaaaat gaatttaaca aagaaacttt aatccgtgcc gccgatgaag 2100

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aagaaaggat tggtttagtt gtagatgaat atggtgatat taaaggctta gtcaccttag 2220

aagatatctt agaagagatt gtcggtgaat ttaccacttc aacagcccca tcaattaacg 2280

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gaatttctta tttaccccgt ttttggcttt tgctagaatc ttgcaattga aattaattct 2700

caataccgta taatgttcaa cattattttg cgatacaaat taaaggatta ttaaa atg  2758
                                                              Met
                                                               1

cca caa tta ttc caa ttc tta caa caa tat att gat tac att att cta   2806
Pro Gln Leu Phe Gln Phe Leu Gln Gln Tyr Ile Asp Tyr Ile Ile Leu
              5                  10                  15

ggc tta ctt gcc ttc atg agc ttt att atg gtt tgg ctt gtg att gaa   2854
Gly Leu Leu Ala Phe Met Ser Phe Ile Met Val Trp Leu Val Ile Glu
         20                  25                  30

cgc ttt ctt ttc tta agt cgc gtc aac gtg gca tct tat gaa agc ata   2902
Arg Phe Leu Phe Leu Ser Arg Val Asn Val Ala Ser Tyr Glu Ser Ile
     35                  40                  45

cat gaa tta gac att gac tta caa cgc cac ctc aca gct atc tct aca   2950
His Glu Leu Asp Ile Asp Leu Gln Arg His Leu Thr Ala Ile Ser Thr
 50                  55                  60                  65

atc ggt tct aat gca cct tat gta ggt ttg ctt ggt acc gtc att ggt   2998
Ile Gly Ser Asn Ala Pro Tyr Val Gly Leu Leu Gly Thr Val Ile Gly
                 70                  75                  80

att ctc tta act ttc tat gaa tta ggt cac tcc ggt ggc gat att gat   3046
Ile Leu Leu Thr Phe Tyr Glu Leu Gly His Ser Gly Gly Asp Ile Asp
             85                  90                  95

gcg gcg gcc att atg gtg cac tta tca tta gcc tta aaa gcc aca gca   3094
Ala Ala Ala Ile Met Val His Leu Ser Leu Ala Leu Lys Ala Thr Ala
        100                 105                 110

gta ggt att tta gtc gcc att cct gca atg gtg tgt tac aac ggt tta   3142
Val Gly Ile Leu Val Ala Ile Pro Ala Met Val Cys Tyr Asn Gly Leu
    115                 120                 125
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gga cgt aaa gtc gaa gtt aat cgt ttg aaa tgg ttt gcc tta aat gag   3190
Gly Arg Lys Val Glu Val Asn Arg Leu Lys Trp Phe Ala Leu Asn Glu
130                 135                 140                 145

aaa aaa gcc aaa caa caa gca tagggagccg tcatgaaaaa gtttgatgaa      3241
Lys Lys Ala Lys Gln Gln Ala
                150

atcaacatta tccctttttat tgacatcatg ttggtactat tggctatcgt tctgattaca 3301

gcctctttta tttcacaagg taaaatccaa gtgaatgtac caaaagcaag ttcaacagtt 3361

gcgtttcgtt cagatgattt agccaaattg ctgactatta cggaaagcgg tgaaattttt 3421

tatcacgata aaccgattac gatagaggca ttggaacaag aaatcagtaa ttgggaaaaa 3481

gatcaaaaag tcaccttgaa ggtagatgca aaatccagtt tccaagattt cgtttctatc 3541

actgatatta tggctaaaaa tgaaattaaa aatgtcgcta tcgtgacggt taaagaaaag 3601

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cgttccatct taataatgcc ggcgtaatta gtaatgcgcg aatcagcaaa tcttccggct 4261

cagaagaatt agataacgct gcactggtag ctgtcaataa tgcccgtcca attggtccac 4321

tgcctgttgg tatgccaaat gaagtgagcg ttcctgtcag tttcagaatc acaaattaaa 4381

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<400> 14

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  1               5                  10                  15

Leu Gly Leu Leu Ala Phe Met Ser Phe Ile Met Val Trp Leu Val Ile
             20                  25                  30

Glu Arg Phe Leu Phe Leu Ser Arg Val Asn Val Ala Ser Tyr Glu Ser
         35                  40                  45
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Ile His Glu Leu Asp Ile Asp Leu Gln Arg His Leu Thr Ala Ile Ser
     50                  55                  60

Thr Ile Gly Ser Asn Ala Pro Tyr Val Gly Leu Leu Gly Thr Val Ile
 65                  70                  75                  80

Gly Ile Leu Leu Thr Phe Tyr Glu Leu Gly His Ser Gly Gly Asp Ile
                 85                  90                  95

Asp Ala Ala Ala Ile Met Val His Leu Ser Leu Ala Leu Lys Ala Thr
            100                 105                 110

Ala Val Gly Ile Leu Val Ala Ile Pro Ala Met Val Cys Tyr Asn Gly
        115                 120                 125

Leu Gly Arg Lys Val Glu Val Asn Arg Leu Lys Trp Phe Ala Leu Asn
    130                 135                 140


Glu Lys Lys Ala Lys Gln Gln Ala
145                 150


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<222> (534)..(6863)

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aactcatcga gcatcaaatg aaactgcaat ttattcatat caggattatc aataccatat 180

ttttgaaaaa gccgtttctg taatgaagga gaaaactcac cgaggcagtt ccataggatg 240

gcaagatcct ggtatcggtc tgcgattccg actcgtccaa catcaataca acctattaat 300

ttcccctcgt caaaaataag gttatcaagt gagaaatcac catgagtgac gactgaatcc 360

ggtgagaatg gcaaaagctt atgcatttct ttccagactt gttcaacagg ccagccatta 420

cgctcgtcat caaaatcact cgcatcaacc aaaccgttat tcattcgtga ttgcgcctga 480

gcgagacgaa atacgcgatc gctgttaaaa ggacaattac aaacaggaat cga atg     536
                                                          Met
                                                            1

caa ccg gcg cag gaa cac tgc cag cgc atc aac aat att gtt aac caa    584
Gln Pro Ala Gln Glu His Cys Gln Arg Ile Asn Asn Ile Val Asn Gln
              5                  10                  15

gaa aac ggt tta ttc cat aca ctc ggt aat atg atg tta gaa gca gag    632
Glu Asn Gly Leu Phe His Thr Leu Gly Asn Met Met Leu Glu Ala Glu
         20                  25                  30
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cgt tct gtt tat aat att ggc gat att tat gcg agt aaa aaa tta aca   680
Arg Ser Val Tyr Asn Ile Gly Asp Ile Tyr Ala Ser Lys Lys Leu Thr
     35                  40                  45

gtt cat act cat aat ttg att aat gat gtg cgt tta tct ggc aat gtg   728
Val His Thr His Asn Leu Ile Asn Asp Val Arg Leu Ser Gly Asn Val
 50                  55                  60                  65

agt tat aag cct atc ggt tca agt cgt gat tat gat atc agt cgt gtt   776
Ser Tyr Lys Pro Ile Gly Ser Ser Arg Asp Tyr Asp Ile Ser Arg Val
                 70                  75                  80

gcg gta cat ggt tgg cac aat aat gtt tat aag ctc aac tta aat ctg   824
Ala Val His Gly Trp His Asn Asn Val Tyr Lys Leu Asn Leu Asn Leu
             85                  90                  95

caa gaa caa gat aaa acc gat att aaa gtt gtg aaa atg ggg gct atc   872
Gln Glu Gln Asp Lys Thr Asp Ile Lys Val Val Lys Met Gly Ala Ile
        100                 105                 110

cgt tct gat ggt gat ttt gac ttt aag gga ata aag gcg aca tca tca   920
Arg Ser Asp Gly Asp Phe Asp Phe Lys Gly Ile Lys Ala Thr Ser Ser
    115                 120                 125

gaa tca aaa ccg cag tta att aat cat gga tta att aat gtc aaa gga   968
Glu Ser Lys Pro Gln Leu Ile Asn His Gly Leu Ile Asn Val Lys Gly
130                 135                 140                 145

aca ttt aat gcg gaa gct gat caa gtg gtg aac caa atg aaa gcg ttt   1016
Thr Phe Asn Ala Glu Ala Asp Gln Val Val Asn Gln Met Lys Ala Phe
                150                 155                 160

aac caa aat gca tta gca agc gtg ttt aag aat cca gcg aaa atc acg   1064
Asn Gln Asn Ala Leu Ala Ser Val Phe Lys Asn Pro Ala Lys Ile Thr
            165                 170                 175

atg tac tat caa cca ctt act cgt tat att tgg aca cca tta tcg ggt   1112
Met Tyr Tyr Gln Pro Leu Thr Arg Tyr Ile Trp Thr Pro Leu Ser Gly
        180                 185                 190

aat gca tcg cgt gaa ttt aac aat tta gag tct ttc ctc gat gcc ttg   1160
Asn Ala Ser Arg Glu Phe Asn Asn Leu Glu Ser Phe Leu Asp Ala Leu
    195                 200                 205

ttt ggc tca aca aca atc tta aaa tca agt ttc tat agt acg gaa aat   1208
Phe Gly Ser Thr Thr Ile Leu Lys Ser Ser Phe Tyr Ser Thr Glu Asn
210                 215                 220                 225

ttt agt gct tat cag ctt cta tct cat att cag cat tca cca atg tac   1256
Phe Ser Ala Tyr Gln Leu Leu Ser His Ile Gln His Ser Pro Met Tyr
                230                 235                 240

caa aaa gcg atg gca caa gtg ttt ggt gca gag tgg cat agt aaa tcc   1304
Gln Lys Ala Met Ala Gln Val Phe Gly Ala Glu Trp His Ser Lys Ser
            245                 250                 255

tat gat gag atg cga aac aaa tgg aaa agc ttt aaa gaa aat cca aca   1352
Tyr Asp Glu Met Arg Asn Lys Trp Lys Ser Phe Lys Glu Asn Pro Thr
        260                 265                 270

gat ttc att tat tac cca tca gaa aaa gca aaa atc cta gcg gga aaa   1400
Asp Phe Ile Tyr Tyr Pro Ser Glu Lys Ala Lys Ile Leu Ala Gly Lys
    275                 280                 285
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cta gaa ggt aag ctt aca acg cta caa aat ggt gaa tat gcc gaa cgt   1448
Leu Glu Gly Lys Leu Thr Thr Leu Gln Asn Gly Glu Tyr Ala Glu Arg
290                 295                 300                 305

ggt aag ttt gat gag agt atc caa att ggt aaa cac caa tta tcg cta   1496
Gly Lys Phe Asp Glu Ser Ile Gln Ile Gly Lys His Gln Leu Ser Leu
                310                 315                 320

cca tca gta gag ctt aaa gcg gag ttt agt gat aaa gaa cgt ttg gaa   1544
Pro Ser Val Glu Leu Lys Ala Glu Phe Ser Asp Lys Glu Arg Leu Glu
            325                 330                 335


gag gac ggg gta gat tta tcc tcg atc gcc gaa ctc tta gaa atg cca   1592
Glu Asp Gly Val Asp Leu Ser Ser Ile Ala Glu Leu Leu Glu Met Pro
        340                 345                 350

aac tta ttt att gat aat agt atc caa tta gaa aag aaa aag ttg tct   1640
Asn Leu Phe Ile Asp Asn Ser Ile Gln Leu Glu Lys Lys Lys Leu Ser
    355                 360                 365

cct att gag gat cta gat gaa gaa cca cgt aaa aat ctg gat ata gaa   1688
Pro Ile Glu Asp Leu Asp Glu Glu Pro Arg Lys Asn Leu Asp Ile Glu
370                 375                 380                 385

gaa agc cat tct aat tca tcg gat gac gtg ctt agc atg aat gat gat   1736
Glu Ser His Ser Asn Ser Ser Asp Asp Val Leu Ser Met Asn Asp Asp
                390                 395                 400

gag tct gat aca gac gat agc aag tgg agt atg ggc aat gat gag aaa   1784
Glu Ser Asp Thr Asp Asp Ser Lys Trp Ser Met Gly Asn Asp Glu Lys
            405                 410                 415

gag atg ccc gat gat aag ctg ggt ata agt cgt gat gat cgt gga aat   1832
Glu Met Pro Asp Asp Lys Leu Gly Ile Ser Arg Asp Asp Arg Gly Asn
        420                 425                 430

aaa cca cct cgt act gat cct aca gtt gat tat ctt aac cct gat gaa   1880
Lys Pro Pro Arg Thr Asp Pro Thr Val Asp Tyr Leu Asn Pro Asp Glu
    435                 440                 445

ttc ttt gaa aat ggt tat ctc ttg aat gag cta cta cag gag ctt gga   1928
Phe Phe Glu Asn Gly Tyr Leu Leu Asn Glu Leu Leu Gln Glu Leu Gly
450                 455                 460                 465

gaa gag ccg tta cta aaa gaa ggg gaa gat cat ttt aaa cgt tct acc   1976
Glu Glu Pro Leu Leu Lys Glu Gly Glu Asp His Phe Lys Arg Ser Thr
                470                 475                 480

aat cta gtc cgt cta ggc gag aga gat agg caa aat aga gaa aag aga   2024
Asn Leu Val Arg Leu Gly Glu Arg Asp Arg Gln Asn Arg Glu Lys Arg
            485                 490                 495

gaa aaa gag ggg tat ttt gat ctg cct ggt aca tta gat atg aaa ctg   2072
Glu Lys Glu Gly Tyr Phe Asp Leu Pro Gly Thr Leu Asp Met Lys Leu
        500                 505                 510

cag gag tta ttc gaa aaa aga aaa caa aaa cac gaa gca gaa cag aaa   2120
Gln Glu Leu Phe Glu Lys Arg Lys Gln Lys His Glu Ala Glu Gln Lys
    515                 520                 525

gca aga ata gaa aaa gca ctt cta caa aaa tca gaa caa caa gaa aaa   2168
Ala Arg Ile Glu Lys Ala Leu Leu Gln Lys Ser Glu Gln Gln Glu Lys
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530                 535                 540                 545

cgt gtt gaa gaa cgt aag caa gag gaa aaa cgt caa gcg caa gat aaa   2216
Arg Val Glu Glu Arg Lys Gln Glu Glu Lys Arg Gln Ala Gln Asp Lys
                550                 555                 560

att gct aag caa gta gaa att gca aaa gaa atg caa cgg gta gaa gaa   2264
Ile Ala Lys Gln Val Glu Ile Ala Lys Glu Met Gln Arg Val Glu Glu
            565                 570                 575


att cgc cag aga gaa aaa caa ctt gcg atc caa ctg caa gaa gaa gag   2312
Ile Arg Gln Arg Glu Lys Gln Leu Ala Ile Gln Leu Gln Glu Glu Glu
        580                 585                 590

aag aaa caa caa gaa gaa aaa cat tta tcc gag gag aaa aaa caa gct   2360
Lys Lys Gln Gln Glu Glu Lys His Leu Ser Glu Glu Lys Lys Gln Ala
    595                 600                 605

gaa cag aaa caa aaa gct gag gag aaa gtt gca caa gaa aga tta gac   2408
Glu Gln Lys Gln Lys Ala Glu Glu Lys Val Ala Gln Glu Arg Leu Asp
610                 615                 620                 625

att gaa caa cag aaa gcg tat gaa gaa atg gcg aag cga gag gca gag   2456
Ile Glu Gln Gln Lys Ala Tyr Glu Glu Met Ala Lys Arg Glu Ala Glu
                630                 635                 640

gca tca aaa aat gtt tta ttg aaa gcg att gat gaa gaa cgt cca aaa   2504
Ala Ser Lys Asn Val Leu Leu Lys Ala Ile Asp Glu Glu Arg Pro Lys
            645                 650                 655

gtg gaa act gat cca ctt ttc cgt aca aaa ttg aaa tat atc aat caa   2552
Val Glu Thr Asp Pro Leu Phe Arg Thr Lys Leu Lys Tyr Ile Asn Gln
        660                 665                 670

gat gac tat gct ggt gca aat tat ttc ttc aat aaa gtt ggt tta aat   2600
Asp Asp Tyr Ala Gly Ala Asn Tyr Phe Phe Asn Lys Val Gly Leu Asn
    675                 680                 685

aca aaa ggt cat caa aaa gta aat gtg tta ggg gat aac tat ttt gat   2648
Thr Lys Gly His Gln Lys Val Asn Val Leu Gly Asp Asn Tyr Phe Asp
690                 695                 700                 705

cat caa gtg att act cgc tcg att gag aaa aaa gta gat aac cac ctt   2696
His Gln Val Ile Thr Arg Ser Ile Glu Lys Lys Val Asp Asn His Leu
                710                 715                 720

aac caa aaa tac aat ctc agc gat gtg gaa tta gtt aaa cag ctg atg   2744
Asn Gln Lys Tyr Asn Leu Ser Asp Val Glu Leu Val Lys Gln Leu Met
            725                 730                 735

gac aat tcc aca aca caa gcg cag gag ttg gat ttg aaa cta ggt gcg   2792
Asp Asn Ser Thr Thr Gln Ala Gln Glu Leu Asp Leu Lys Leu Gly Ala
        740                 745                 750

gca tta act aaa gaa caa caa gct aac ttg acc caa gat atc gtt tgg   2840
Ala Leu Thr Lys Glu Gln Gln Ala Asn Leu Thr Gln Asp Ile Val Trp
    755                 760                 765

tat gtc aaa acg aag gta aag ggc aaa gat gtg ttt gtt cca aag gtt   2888
Tyr Val Lys Thr Lys Val Lys Gly Lys Asp Val Phe Val Pro Lys Val
770                 775                 780                 785
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tat ttc gct tct gaa acg ctc gta gaa gcc caa aaa tta caa ggt tta   2936
Tyr Phe Ala Ser Glu Thr Leu Val Glu Ala Gln Lys Leu Gln Gly Leu
                790                 795                 800

ggc act ggg act atc aga gtt ggt gaa gct aag att aaa gcc aaa gat   2984
Gly Thr Gly Thr Ile Arg Val Gly Glu Ala Lys Ile Lys Ala Lys Asp
            805                 810                 815


gtg gtg aat acc ggg aca tta gct ggg aga aaa ctc aat gtt gaa gcg   3032
Val Val Asn Thr Gly Thr Leu Ala Gly Arg Lys Leu Asn Val Glu Ala
        820                 825                 830

agt aat aaa atc aaa aat caa ggg agt atc tta agt act caa gaa aca   3080
Ser Asn Lys Ile Lys Asn Gln Gly Ser Ile Leu Ser Thr Gln Glu Thr
    835                 840                 845

cgt tta gtc ggg cgt aaa ggt att gaa aac gta tct cgt tca ttt gca   3128
Arg Leu Val Gly Arg Lys Gly Ile Glu Asn Val Ser Arg Ser Phe Ala
850                 855                 860                 865

aat gat gaa tta gga gtc act gca caa cgc tca gaa atc aaa acg gaa   3176
Asn Asp Glu Leu Gly Val Thr Ala Gln Arg Ser Glu Ile Lys Thr Glu
                870                 875                 880

ggt cat tta cat ctt gaa aca gat aag gat tca act att gat gta caa   3224
Gly His Leu His Leu Glu Thr Asp Lys Asp Ser Thr Ile Asp Val Gln
            885                 890                 895

gca tcg gat att aaa gca aaa aca agc ttt gtg aag act ggt gat gtg   3272
Ala Ser Asp Ile Lys Ala Lys Thr Ser Phe Val Lys Thr Gly Asp Val
        900                 905                 910

aat ctc aaa aat aca tac aat act aaa cat gcc tac cgt gag aaa ttc   3320
Asn Leu Lys Asn Thr Tyr Asn Thr Lys His Ala Tyr Arg Glu Lys Phe
    915                 920                 925

tcg ccg agt gca cta caa gtt gca gaa ctt gat gtg gca ggg ctt aaa   3368
Ser Pro Ser Ala Leu Gln Val Ala Glu Leu Asp Val Ala Gly Leu Lys
930                 935                 940                 945

gtc cca ctt tta ggc gtg tcg tct cca tcc agt tat tca gag cat act   3416
Val Pro Leu Leu Gly Val Ser Ser Pro Ser Ser Tyr Ser Glu His Thr
                950                 955                 960

agt gag gca act tca gag gga tca atc ttc gaa gta ggg cac tta cat   3464
Ser Glu Ala Thr Ser Glu Gly Ser Ile Phe Glu Val Gly His Leu His
            965                 970                 975

ctt gcg gta gac aga gat gtg aac caa gcg ggg agt aaa att aag gct   3512
Leu Ala Val Asp Arg Asp Val Asn Gln Ala Gly Ser Lys Ile Lys Ala
        980                 985                 990

aag tat acc act ggt gtt gtg aaa ggg aac ttt aat act gaa gcg ggc   3560
Lys Tyr Thr Thr Gly Val Val Lys Gly Asn Phe Asn Thr Glu Ala Gly
    995                1000                1005

aag aat att aaa cat gtc gaa aaa gaa gaa tat agt tca cag cta ttt   3608
Lys Asn Ile Lys His Val Glu Lys Glu Glu Tyr Ser Ser Gln Leu Phe
1010                1015                1020                1025

gct tca gca cac gcg agt ggt ggt ggc acc tca gtt cgt tat gac tat   3656
Ala Ser Ala His Ala Ser Gly Gly Gly Thr Ser Val Arg Tyr Asp Tyr
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                1030                1035                1040

aac agc caa gat ggt ggc aat gcc tct gtt ggt gtt ccg aca aac cat   3704
Asn Ser Gln Asp Gly Gly Asn Ala Ser Val Gly Val Pro Thr Asn His
            1045                1050                1055


act gga gtt ggg gca gag gca gga atg tca ttc acc cat acc aaa gac   3752
Thr Gly Val Gly Ala Glu Ala Gly Met Ser Phe Thr His Thr Lys Asp
        1060                1065                1070

aaa gaa aca ctg ctc act cac acc aat agt gaa tta caa gtc aaa cat   3800
Lys Glu Thr Leu Leu Thr His Thr Asn Ser Glu Leu Gln Val Lys His
    1075                1080                1085

ggg aaa tta cat gtg ctt ggt tat gcc gat att ggt gga gta gat att   3848
Gly Lys Leu His Val Leu Gly Tyr Ala Asp Ile Gly Gly Val Asp Ile
1090                1095                1100                1105

aat act aaa cta cca gaa gat gca caa agc aaa gca cag aaa gag ata   3896
Asn Thr Lys Leu Pro Glu Asp Ala Gln Ser Lys Ala Gln Lys Glu Ile
                1110                1115                1120

gcg gct agc aag cca gag aag acc gag caa tct gca cag gat gtg gct   3944
Ala Ala Ser Lys Pro Glu Lys Thr Glu Gln Ser Ala Gln Asp Val Ala
            1125                1130                1135

caa gct caa tca aat gcc aat aag gat aag gaa aat aaa gcc cca gaa   3992
Gln Ala Gln Ser Asn Ala Asn Lys Asp Lys Glu Asn Lys Ala Pro Glu
        1140                1145                1150

ata aaa gaa tta tca gag gct gaa atc gcg gat ctc atg tca gaa aaa   4040
Ile Lys Glu Leu Ser Glu Ala Glu Ile Ala Asp Leu Met Ser Glu Lys
    1155                1160                1165

tca aaa gcg tat ttt gat gat ttt gca gag caa gcg aaa aaa gca cct   4088
Ser Lys Ala Tyr Phe Asp Asp Phe Ala Glu Gln Ala Lys Lys Ala Pro
1170                1175                1180                1185

gaa aac aat cga ttt gaa ttg tct gcg aaa gaa att aag tcg agc aaa   4136
Glu Asn Asn Arg Phe Glu Leu Ser Ala Lys Glu Ile Lys Ser Ser Lys
                1190                1195                1200

caa aaa gac caa tat gat cat gag tct gaa cgg acg act ttt aaa gtt   4184
Gln Lys Asp Gln Tyr Asp His Glu Ser Glu Arg Thr Thr Phe Lys Val
            1205                1210                1215

gga cct gaa gcg gag gct cat tct gcg gtt gcc gat atg gtg agc cat   4232
Gly Pro Glu Ala Glu Ala His Ser Ala Val Ala Asp Met Val Ser His
        1220                1225                1230

tta gtg aaa gaa tat aga gat gca caa aat ggg act aaa caa gac ggt   4280
Leu Val Lys Glu Tyr Arg Asp Ala Gln Asn Gly Thr Lys Gln Asp Gly
    1235                1240                1245

aca gta gca tta caa cat gct agt gat gtc tta aat att gtg acg ggg   4328
Thr Val Ala Leu Gln His Ala Ser Asp Val Leu Asn Ile Val Thr Gly
1250                1255                1260                1265

gat tta gcg ggg agt tca gct aaa ttg tct gtt gaa aga aca cat gag   4376
Asp Leu Ala Gly Ser Ser Ala Lys Leu Ser Val Glu Arg Thr His Glu
                1270                1275                1280
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aca aaa cga acg aca gaa acg ggg gat att gtt act aag att ggt ggc   4424
Thr Lys Arg Thr Thr Glu Thr Gly Asp Ile Val Thr Lys Ile Gly Gly
          1285                1290                1295

aat gtc aca ctg tca gca cgc agt ggt agt gtg aac ctt aaa aat gta   4472
Asn Val Thr Leu Ser Ala Arg Ser Gly Ser Val Asn Leu Lys Asn Val
       1300                1305                1310

caa agt gat gaa caa gct aat ttg acc tta aga gca aaa gaa gat gtg   4520
Gln Ser Asp Glu Gln Ala Asn Leu Thr Leu Arg Ala Lys Glu Asp Val
   1315                1320                1325

aat gtg ctg tct ggt gaa aaa aca cga gaa acc aca gaa aca gta tca   4568
Asn Val Leu Ser Gly Glu Lys Thr Arg Glu Thr Thr Glu Thr Val Ser
1330                1335                1340                1345

aga cag aaa ctt tct cat ggt gtg aac gca ggt tgc agt atg atg agt   4616
Arg Gln Lys Leu Ser His Gly Val Asn Ala Gly Cys Ser Met Met Ser
               1350                1355                1360

ggc gcc tgt act gcc ggt gtt agc aca tca ctt gaa gga aat gaa agc   4664
Gly Ala Cys Thr Ala Gly Val Ser Thr Ser Leu Glu Gly Asn Glu Ser
          1365                1370                1375

tat acg tca gaa cgt gaa acg gct caa aat aac agt ttc tta aaa gca   4712
Tyr Thr Ser Glu Arg Glu Thr Ala Gln Asn Asn Ser Phe Leu Lys Ala
       1380                1385                1390

cgc aac atg aaa gtt gaa gca ggt cgc gat ttt aat gtt gtc agt tcg   4760
Arg Asn Met Lys Val Glu Ala Gly Arg Asp Phe Asn Val Val Ser Ser
   1395                1400                1405

aat att gat gca gat aag ctc gat ctc cac gtt aaa gga aaa acg aat   4808
Asn Ile Asp Ala Asp Lys Leu Asp Leu His Val Lys Gly Lys Thr Asn
1410                1415                1420                1425

gtg gta tcc aaa caa gat acg tta caa aaa gtg acg cat gga gtt gac   4856
Val Val Ser Lys Gln Asp Thr Leu Gln Lys Val Thr His Gly Val Asp
               1430                1435                1440

tat aat ctt tcc gct ggc gtt gca ctt tct agt gca aca att gct acc   4904
Tyr Asn Leu Ser Ala Gly Val Ala Leu Ser Ser Ala Thr Ile Ala Thr
          1445                1450                1455

cca acc ggt aat gtt ggt ttc ggt tat acc aat gag acc gaa agc aag   4952
Pro Thr Gly Asn Val Gly Phe Gly Tyr Thr Asn Glu Thr Glu Ser Lys
       1460                1465                1470

cgg acg gtt aat caa caa gca ggg att aaa gcg aat aaa att aca ggg   5000
Arg Thr Val Asn Gln Gln Ala Gly Ile Lys Ala Asn Lys Ile Thr Gly
   1475                1480                1485

caa acg cat gac tta aat ctt gag ggg gga tat ctt gtc agc aac gat   5048
Gln Thr His Asp Leu Asn Leu Glu Gly Gly Tyr Leu Val Ser Asn Asp
1490                1495                1500                1505

aag gat aat cag ctg aaa gtt acc ggc gat gtc aca act aaa gcc ctt   5096
Lys Asp Asn Gln Leu Lys Val Thr Gly Asp Val Thr Thr Lys Ala Leu
               1510                1515                1520

cac gat caa cat gat aaa gat ggt gga aca ttt ggt tta tct gtg ggt   5144
His Asp Gln His Asp Lys Asp Gly Gly Thr Phe Gly Leu Ser Val Gly
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          1525                1530                1535

atc agt gaa cgt ggt act acc gcc ttt aat gta cga ggt ggg cga gct   5192
Ile Ser Glu Arg Gly Thr Thr Ala Phe Asn Val Arg Gly Gly Arg Ala
       1540                1545                1550

gaa cag aaa cac tat aat gca acg cag aaa tcc act ctt tct ggc gtg   5240
Glu Gln Lys His Tyr Asn Ala Thr Gln Lys Ser Thr Leu Ser Gly Val
   1555                1560                1565

gat acc tct caa gcg aat gta tca ggt caa gtg aat aca gat tta acc   5288
Asp Thr Ser Gln Ala Asn Val Ser Gly Gln Val Asn Thr Asp Leu Thr
1570                1575                1580                1585

aag gca aaa gct gtc aca cgt gat gat act tac gca agt acg caa ttt   5336
Lys Ala Lys Ala Val Thr Arg Asp Asp Thr Tyr Ala Ser Thr Gln Phe
               1590                1595                1600

agt ttt gaa gtg gca gat att gtg gaa tta gga cag aga gcg aaa aac   5384
Ser Phe Glu Val Ala Asp Ile Val Glu Leu Gly Gln Arg Ala Lys Asn
           1605                1610                1615

aag ctg tca gca cca aac aat gac acc gat atg gcg tca ggc tcc aca   5432
Lys Leu Ser Ala Pro Asn Asn Asp Thr Asp Met Ala Ser Gly Ser Thr
       1620                1625                1630

tta cgc tcg cgt tct act aca gaa gaa gca gat gta cca aca aca aga   5480
Leu Arg Ser Arg Ser Thr Thr Glu Glu Ala Asp Val Pro Thr Thr Arg
   1635                1640                1645

tcg cgt gta acg gat gag gcg gat tct gta tcc gtg aaa aat ccg att   5528
Ser Arg Val Thr Asp Glu Ala Asp Ser Val Ser Val Lys Asn Pro Ile
1650                1655                1660                1665

tat gaa agt gca gat gct gtt gta cca aca cca cgt agt aga aat gtg   5576
Tyr Glu Ser Ala Asp Ala Val Val Pro Thr Pro Arg Ser Arg Asn Val
               1670                1675                1680

gac agt acc gat ctt gtg gac aat cca ctg tat gct agt gcc act aca   5624
Asp Ser Thr Asp Leu Val Asp Asn Pro Leu Tyr Ala Ser Ala Thr Thr
           1685                1690                1695

aaa gca aac atc cat gat tat gaa gaa att cca gcc gtt tat agc aaa   5672
Lys Ala Asn Ile His Asp Tyr Glu Glu Ile Pro Ala Val Tyr Ser Lys
       1700                1705                1710

gtc ggt gat aac aat gct gat ctt gtt cgt cat aaa acg gca act agt   5720
Val Gly Asp Asn Asn Ala Asp Leu Val Arg His Lys Thr Ala Thr Ser
   1715                1720                1725

gat gag cat ctt tat gca gag att aat gaa cca aca tat agc cgt gtt   5768
Asp Glu His Leu Tyr Ala Glu Ile Asn Glu Pro Thr Tyr Ser Arg Val
1730                1735                1740                1745

ggt gat aaa aat gca gat atg aga cgt cat aac gcg gca ggt aca aca   5816
Gly Asp Lys Asn Ala Asp Met Arg Arg His Asn Ala Ala Gly Thr Thr
               1750                1755                1760

gac tat gcc gat gtc gtg caa gca cat aca aga aag gca gat gat cca   5864
Asp Tyr Ala Asp Val Val Gln Ala His Thr Arg Lys Ala Asp Asp Pro
           1765                1770                1775
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cta cca gca tta ccg aat cag ggt aaa gca aga acg gta aac gac ggt   5912
Leu Pro Ala Leu Pro Asn Gln Gly Lys Ala Arg Thr Val Asn Asp Gly
       1780                1785                1790

tca gag cat att tat act gat att agc gac gtg ggc act caa act aaa   5960
Ser Glu His Ile Tyr Thr Asp Ile Ser Asp Val Gly Thr Gln Thr Lys
   1795                1800                1805

gct att gat agt act tat gca aca gta ggc atg ccg aaa gcg aat gcc   6008
Ala Ile Asp Ser Thr Tyr Ala Thr Val Gly Met Pro Lys Ala Asn Ala
1810                1815                1820                1825

gtt aac ttg ata ggg caa aat ggc tta ggc agc att tat cac agc cca   6056
Val Asn Leu Ile Gly Gln Asn Gly Leu Gly Ser Ile Tyr His Ser Pro
               1830                1835                1840

gac agt gct tat aaa aca tgg caa ttg ctt gat caa ttt gcc aac aaa   6104
Asp Ser Ala Tyr Lys Thr Trp Gln Leu Leu Asp Gln Phe Ala Asn Lys
           1845                1850                1855

ggc gga gat gcg gtc ttc tta cgc cct gca aca gaa atg aaa tgt gca   6152
Gly Gly Asp Ala Val Phe Leu Arg Pro Ala Thr Glu Met Lys Cys Ala
       1860                1865                1870

ggt gca cct tta aaa tat acc ttt atc gtg cgt gat tat ttg ctc aga   6200
Gly Ala Pro Leu Lys Tyr Thr Phe Ile Val Arg Asp Tyr Leu Leu Arg
   1875                1880                1885

cgc cat acc tta gat aaa tca aga tta ttt tat aac gca cat aat aaa   6248
Arg His Thr Leu Asp Lys Ser Arg Leu Phe Tyr Asn Ala His Asn Lys
1890                1895                1900                1905

acc tta ttt agc gtg cct atc gtt gat gca aaa gtc aaa atg ctg ttt   6296
Thr Leu Phe Ser Val Pro Ile Val Asp Ala Lys Val Lys Met Leu Phe
               1910                1915                1920

gct gaa aaa aat atc caa gtc aat tac gat cgt agc ctt aca gcc att   6344
Ala Glu Lys Asn Ile Gln Val Asn Tyr Asp Arg Ser Leu Thr Ala Ile
           1925                1930                1935

gat ctg agt aaa cgt att gcg acc ttt aat agc cca gaa gga gtt gta   6392
Asp Leu Ser Lys Arg Ile Ala Thr Phe Asn Ser Pro Glu Gly Val Val
       1940                1945                1950

gaa gtc cct tat gat ttt att aat gtg gta cct cca atg cga gca cct   6440
Glu Val Pro Tyr Asp Phe Ile Asn Val Val Pro Pro Met Arg Ala Pro
   1955                1960                1965

gat gcc gtt cgt caa tca gca ctc gcg tgg caa gaa gga aaa tgg gct   6488
Asp Ala Val Arg Gln Ser Ala Leu Ala Trp Gln Glu Gly Lys Trp Ala
1970                1975                1980                1985

aac gat ggt tgg gtt gaa gta gaa aaa cat acc ttg cgt cac cgt cgt   6536
Asn Asp Gly Trp Val Glu Val Glu Lys His Thr Leu Arg His Arg Arg
               1990                1995                2000

tat gcc aat gtg ttt gct gtg ggt gat gtg gca ggg gtc cca aaa ggc   6584
Tyr Ala Asn Val Phe Ala Val Gly Asp Val Ala Gly Val Pro Lys Gly
           2005                2010                2015


aaa acg gct gcc agt gtc aaa tgg caa gtt cct gtt gca gtg gca cat   6632
Lys Thr Ala Ala Ser Val Lys Trp Gln Val Pro Val Ala Val Ala His
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       2020                2025                2030

tta ctc gca gaa tta gag ggc aaa cct tgt gat gaa att tac aac ggt   6680
Leu Leu Ala Glu Leu Glu Gly Lys Pro Cys Asp Glu Ile Tyr Asn Gly
   2035                2040                2045

tat aca tct tgt cca tta att act caa tta gga aag ggg atg cta gta   6728
Tyr Thr Ser Cys Pro Leu Ile Thr Gln Leu Gly Lys Gly Met Leu Val
2050                2055                2060                2065

gaa ttt gat tat aac aac cac tta aca cct tct ttc ccc ggt gta ata   6776
Glu Phe Asp Tyr Asn Asn His Leu Thr Pro Ser Phe Pro Gly Val Ile
             2070                2075                2080

gcg cca tta gaa gaa ctg tgg gca aca tgg gca att aaa aca tta ggt   6824
Ala Pro Leu Glu Glu Leu Trp Ala Thr Trp Ala Ile Lys Thr Leu Gly
          2085                2090                2095

tta aaa ccc act tat tta ggt atg tta cgt gga tta gct taaggagcgt   6873
Leu Lys Pro Thr Tyr Leu Gly Met Leu Arg Gly Leu Ala
       2100                2105                2110

tga                                                               6876
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<210> 16
<211> 2110
<212> PRT
<213> Pasteurella multocida

<400> 16

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Met Gln Pro Ala Gln Glu His Cys Gln Arg Ile Asn Asn Ile Val Asn
  1               5                  10                  15

Gln Glu Asn Gly Leu Phe His Thr Leu Gly Asn Met Met Leu Glu Ala
            20                  25                  30

Glu Arg Ser Val Tyr Asn Ile Gly Asp Ile Tyr Ala Ser Lys Lys Leu
         35                  40                  45

Thr Val His Thr His Asn Leu Ile Asn Asp Val Arg Leu Ser Gly Asn
     50                  55                  60

Val Ser Tyr Lys Pro Ile Gly Ser Ser Arg Asp Tyr Asp Ile Ser Arg
 65                  70                  75                  80

Val Ala Val His Gly Trp His Asn Asn Val Tyr Lys Leu Asn Leu Asn
                85                  90                  95

Leu Gln Glu Gln Asp Lys Thr Asp Ile Lys Val Val Lys Met Gly Ala
            100                 105                 110

Ile Arg Ser Asp Gly Asp Phe Asp Phe Lys Gly Ile Lys Ala Thr Ser
        115                 120                 125

Ser Glu Ser Lys Pro Gln Leu Ile Asn His Gly Leu Ile Asn Val Lys
    130                 135                 140

Gly Thr Phe Asn Ala Glu Ala Asp Gln Val Val Asn Gln Met Lys Ala
145                 150                 155                 160

Phe Asn Gln Asn Ala Leu Ala Ser Val Phe Lys Asn Pro Ala Lys Ile
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                165                 170                 175

Thr Met Tyr Tyr Gln Pro Leu Thr Arg Tyr Ile Trp Thr Pro Leu Ser
            180                 185                 190

Gly Asn Ala Ser Arg Glu Phe Asn Asn Leu Glu Ser Phe Leu Asp Ala
        195                 200                 205

Leu Phe Gly Ser Thr Thr Ile Leu Lys Ser Ser Phe Tyr Ser Thr Glu
    210                 215                 220

Asn Phe Ser Ala Tyr Gln Leu Leu Ser His Ile Gln His Ser Pro Met
225                 230                 235                 240

Tyr Gln Lys Ala Met Ala Gln Val Phe Gly Ala Glu Trp His Ser Lys
                245                 250                 255

Ser Tyr Asp Glu Met Arg Asn Lys Trp Lys Ser Phe Lys Glu Asn Pro
            260                 265                 270

Thr Asp Phe Ile Tyr Tyr Pro Ser Glu Lys Ala Lys Ile Leu Ala Gly
        275                 280                 285

Lys Leu Glu Gly Lys Leu Thr Thr Leu Gln Asn Gly Glu Tyr Ala Glu
    290                 295                 300

Arg Gly Lys Phe Asp Glu Ser Ile Gln Ile Gly Lys His Gln Leu Ser
305                 310                 315                 320

Leu Pro Ser Val Glu Leu Lys Ala Glu Phe Ser Asp Lys Glu Arg Leu
                325                 330                 335

Glu Glu Asp Gly Val Asp Leu Ser Ser Ile Ala Glu Leu Leu Glu Met
            340                 345                 350

Pro Asn Leu Phe Ile Asp Asn Ser Ile Gln Leu Glu Lys Lys Lys Leu
        355                 360                 365

Ser Pro Ile Glu Asp Leu Asp Glu Glu Pro Arg Lys Asn Leu Asp Ile
    370                 375                 380

Glu Glu Ser His Ser Asn Ser Ser Asp Asp Val Leu Ser Met Asn Asp
385                 390                 395                 400

Asp Glu Ser Asp Thr Asp Asp Ser Lys Trp Ser Met Gly Asn Asp Glu
                405                 410                 415

Lys Glu Met Pro Asp Asp Lys Leu Gly Ile Ser Arg Asp Asp Arg Gly
            420                 425                 430

Asn Lys Pro Pro Arg Thr Asp Pro Thr Val Asp Tyr Leu Asn Pro Asp
        435                 440                 445

Glu Phe Phe Glu Asn Gly Tyr Leu Leu Asn Glu Leu Leu Gln Glu Leu
    450                 455                 460

Gly Glu Glu Pro Leu Leu Lys Glu Gly Glu Asp His Phe Lys Arg Ser
465                 470                 475                 480

Thr Asn Leu Val Arg Leu Gly Glu Arg Asp Arg Gln Asn Arg Glu Lys
                485                 490                 495
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Arg Glu Lys Glu Gly Tyr Phe Asp Leu Pro Gly Thr Leu Asp Met Lys
            500                 505                 510

Leu Gln Glu Leu Phe Glu Lys Arg Lys Gln Lys His Glu Ala Glu Gln
        515                 520                 525

Lys Ala Arg Ile Glu Lys Ala Leu Leu Gln Lys Ser Glu Gln Gln Glu
    530                 535                 540

Lys Arg Val Glu Glu Arg Lys Gln Glu Glu Lys Arg Gln Ala Gln Asp
545                 550                 555                 560

Lys Ile Ala Lys Gln Val Glu Ile Ala Lys Glu Met Gln Arg Val Glu
                565                 570                 575

Glu Ile Arg Gln Arg Glu Lys Gln Leu Ala Ile Gln Leu Gln Glu Glu
            580                 585                 590

Glu Lys Lys Gln Gln Glu Glu Lys His Leu Ser Glu Glu Lys Lys Gln
        595                 600                 605

Ala Glu Gln Lys Gln Lys Ala Glu Glu Lys Val Ala Gln Glu Arg Leu
    610                 615                 620

Asp Ile Glu Gln Gln Lys Ala Tyr Glu Glu Met Ala Lys Arg Glu Ala
625                 630                 635                 640

Glu Ala Ser Lys Asn Val Leu Leu Lys Ala Ile Asp Glu Glu Arg Pro
                645                 650                 655

Lys Val Glu Thr Asp Pro Leu Phe Arg Thr Lys Leu Lys Tyr Ile Asn
            660                 665                 670

Gln Asp Asp Tyr Ala Gly Ala Asn Tyr Phe Phe Asn Lys Val Gly Leu
        675                 680                 685

Asn Thr Lys Gly His Gln Lys Val Asn Val Leu Gly Asp Asn Tyr Phe
    690                 695                 700

Asp His Gln Val Ile Thr Arg Ser Ile Glu Lys Lys Val Asp Asn His
705                 710                 715                 720

Leu Asn Gln Lys Tyr Asn Leu Ser Asp Val Glu Leu Val Lys Gln Leu
                725                 730                 735

Met Asp Asn Ser Thr Thr Gln Ala Gln Glu Leu Asp Leu Lys Leu Gly
            740                 745                 750

Ala Ala Leu Thr Lys Glu Gln Gln Ala Asn Leu Thr Gln Asp Ile Val
        755                 760                 765

Trp Tyr Val Lys Thr Lys Val Lys Gly Lys Asp Val Phe Val Pro Lys
    770                 775                 780

Val Tyr Phe Ala Ser Glu Thr Leu Val Glu Ala Gln Lys Leu Gln Gly
785                 790                 795                 800

Leu Gly Thr Gly Thr Ile Arg Val Gly Glu Ala Lys Ile Lys Ala Lys
                805                 810                 815

Asp Val Val Asn Thr Gly Thr Leu Ala Gly Arg Lys Leu Asn Val Glu
            820                 825                 830
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Ala Ser Asn Lys Ile Lys Asn Gln Gly Ser Ile Leu Ser Thr Gln Glu
        835                 840                 845

Thr Arg Leu Val Gly Arg Lys Gly Ile Glu Asn Val Ser Arg Ser Phe
    850                 855                 860

Ala Asn Asp Glu Leu Gly Val Thr Ala Gln Arg Ser Glu Ile Lys Thr
865                 870                 875                 880

Glu Gly His Leu His Leu Glu Thr Asp Lys Asp Ser Thr Ile Asp Val
                885                 890                 895

Gln Ala Ser Asp Ile Lys Ala Lys Thr Ser Phe Val Lys Thr Gly Asp
            900                 905                 910

Val Asn Leu Lys Asn Thr Tyr Asn Thr Lys His Ala Tyr Arg Glu Lys
        915                 920                 925

Phe Ser Pro Ser Ala Leu Gln Val Ala Glu Leu Asp Val Ala Gly Leu
    930                 935                 940

Lys Val Pro Leu Leu Gly Val Ser Ser Pro Ser Ser Tyr Ser Glu His
945                 950                 955                 960

Thr Ser Glu Ala Thr Ser Glu Gly Ser Ile Phe Glu Val Gly His Leu
                965                 970                 975

His Leu Ala Val Asp Arg Asp Val Asn Gln Ala Gly Ser Lys Ile Lys
            980                 985                 990

Ala Lys Tyr Thr Thr Gly Val Val Lys Gly Asn Phe Asn Thr Glu Ala
        995                 1000                1005

Gly Lys Asn Ile Lys His Val Glu Lys Glu Glu Tyr Ser Ser Gln Leu
    1010                1015                1020

Phe Ala Ser Ala His Ala Ser Gly Gly Gly Thr Ser Val Arg Tyr Asp
1025                1030                1035                1040

Tyr Asn Ser Gln Asp Gly Gly Asn Ala Ser Val Gly Val Pro Thr Asn
                1045                1050                1055

His Thr Gly Val Gly Ala Glu Ala Gly Met Ser Phe Thr His Thr Lys
            1060                1065                1070

Asp Lys Glu Thr Leu Leu Thr His Thr Asn Ser Glu Leu Gln Val Lys
        1075                1080                1085

His Gly Lys Leu His Val Leu Gly Tyr Ala Asp Ile Gly Gly Val Asp
    1090                1095                1100

Ile Asn Thr Lys Leu Pro Glu Asp Ala Gln Ser Lys Ala Gln Lys Glu
1105                1110                1115                1120

Ile Ala Ala Ser Lys Pro Glu Lys Thr Glu Gln Ser Ala Gln Asp Val
                1125                1130                1135

Ala Gln Ala Gln Ser Asn Ala Asn Lys Asp Lys Glu Asn Lys Ala Pro
            1140                1145                1150

Glu Ile Lys Glu Leu Ser Glu Ala Glu Ile Ala Asp Leu Met Ser Glu
        1155                1160                1165
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Lys Ser Lys Ala Tyr Phe Asp Asp Phe Ala Glu Gln Ala Lys Lys Ala
1170 1175 1180

Pro Glu Asn Asn Arg Phe Glu Leu Ser Ala Lys Glu Ile Lys Ser Ser
1185 1190 1195 1200

Lys Gln Lys Asp Gln Tyr Asp His Glu Ser Glu Arg Thr Thr Phe Lys
1205 1210 1215

Val Gly Pro Glu Ala Glu Ala His Ser Ala Val Ala Asp Met Val Ser
1220 1225 1230

His Leu Val Lys Glu Tyr Arg Asp Ala Gln Asn Gly Thr Lys Gln Asp
1235 1240 1245

Gly Thr Val Ala Leu Gln His Ala Ser Asp Val Leu Asn Ile Val Thr
1250 1255 1260

Gly Asp Leu Ala Gly Ser Ser Ala Lys Leu Ser Val Glu Arg Thr His
1265 1270 1275 1280

Glu Thr Lys Arg Thr Thr Glu Thr Gly Asp Ile Val Thr Lys Ile Gly
1285 1290 1295

Gly Asn Val Thr Leu Ser Ala Arg Ser Gly Ser Val Asn Leu Lys Asn
1300 1305 1310

Val Gln Ser Asp Glu Gln Ala Asn Leu Thr Leu Arg Ala Lys Glu Asp
1315 1320 1325

Val Asn Val Leu Ser Gly Glu Lys Thr Arg Glu Thr Thr Glu Thr Val
1330 1335 1340

Ser Arg Gln Lys Leu Ser His Gly Val Asn Ala Gly Cys Ser Met Met
1345 1350 1355 1360

Ser Gly Ala Cys Thr Ala Gly Val Ser Thr Ser Leu Glu Gly Asn Glu
1365 1370 1375

Ser Tyr Thr Ser Glu Arg Glu Thr Ala Gln Asn Asn Ser Phe Leu Lys
1380 1385 1390

Ala Arg Asn Met Lys Val Glu Ala Gly Arg Asp Phe Asn Val Val Ser
1395 1400 1405

Ser Asn Ile Asp Ala Asp Lys Leu Asp Leu His Val Lys Gly Lys Thr
1410 1415 1420

Asn Val Val Ser Lys Gln Asp Thr Leu Gln Lys Val Thr His Gly Val
1425 1430 1435 1440

Asp Tyr Asn Leu Ser Ala Gly Val Ala Leu Ser Ser Ala Thr Ile Ala
1445 1450 1455

Thr Pro Thr Gly Asn Val Gly Phe Gly Tyr Thr Asn Glu Thr Glu Ser
1460 1465 1470

Lys Arg Thr Val Asn Gln Gln Ala Gly Ile Lys Ala Asn Lys Ile Thr
1475 1480 1485

Gly Gln Thr His Asp Leu Asn Leu Glu Gly Gly Tyr Leu Val Ser Asn
1490 1495 1500

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Asp Lys Asp Asn Gln Leu Lys Val Thr Gly Asp Val Thr Thr Lys Ala
1505                1510                1515                1520

Leu His Asp Gln His Asp Lys Asp Gly Gly Thr Phe Gly Leu Ser Val
                1525                1530                1535

Gly Ile Ser Glu Arg Gly Thr Thr Ala Phe Asn Val Arg Gly Gly Arg
            1540                1545                1550

Ala Glu Gln Lys His Tyr Asn Ala Thr Gln Lys Ser Thr Leu Ser Gly
        1555                1560                1565

Val Asp Thr Ser Gln Ala Asn Val Ser Gly Gln Val Asn Thr Asp Leu
    1570                1575                1580

Thr Lys Ala Lys Ala Val Thr Arg Asp Asp Thr Tyr Ala Ser Thr Gln
1585                1590                1595                1600

Phe Ser Phe Glu Val Ala Asp Ile Val Glu Leu Gly Gln Arg Ala Lys
                1605                1610                1615

Asn Lys Leu Ser Ala Pro Asn Asn Asp Thr Asp Met Ala Ser Gly Ser
            1620                1625                1630

Thr Leu Arg Ser Arg Ser Thr Thr Glu Glu Ala Asp Val Pro Thr Thr
        1635                1640                1645

Arg Ser Arg Val Thr Asp Glu Ala Asp Ser Val Ser Val Lys Asn Pro
    1650                1655                1660

Ile Tyr Glu Ser Ala Asp Ala Val Val Pro Thr Pro Arg Ser Arg Asn
1665                1670                1675                1680

Val Asp Ser Thr Asp Leu Val Asp Asn Pro Leu Tyr Ala Ser Ala Thr
                1685                1690                1695

Thr Lys Ala Asn Ile His Asp Tyr Glu Glu Ile Pro Ala Val Tyr Ser
            1700                1705                1710

Lys Val Gly Asp Asn Asn Ala Asp Leu Val Arg His Lys Thr Ala Thr
        1715                1720                1725

Ser Asp Glu His Leu Tyr Ala Glu Ile Asn Glu Pro Thr Tyr Ser Arg
    1730                1735                1740


Val Gly Asp Lys Asn Ala Asp Met Arg Arg His Asn Ala Ala Gly Thr
1745                1750                1755                1760

Thr Asp Tyr Ala Asp Val Val Gln Ala His Thr Arg Lys Ala Asp Asp
                1765                1770                1775

Pro Leu Pro Ala Leu Pro Asn Gln Gly Lys Ala Arg Thr Val Asn Asp
            1780                1785                1790

Gly Ser Glu His Ile Tyr Thr Asp Ile Ser Asp Val Gly Thr Gln Thr
        1795                1800                1805

Lys Ala Ile Asp Ser Thr Tyr Ala Thr Val Gly Met Pro Lys Ala Asn
    1810                1815                1820

Ala Val Asn Leu Ile Gly Gln Asn Gly Leu Gly Ser Ile Tyr His Ser
1825                1830                1835                1840
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Pro Asp Ser Ala Tyr Lys Thr Trp Gln Leu Leu Asp Gln Phe Ala Asn
                1845                1850                1855

Lys Gly Gly Asp Ala Val Phe Leu Arg Pro Ala Thr Glu Met Lys Cys
            1860                1865                1870


Ala Gly Ala Pro Leu Lys Tyr Thr Phe Ile Val Arg Asp Tyr Leu Leu
        1875                1880                1885

Arg Arg His Thr Leu Asp Lys Ser Arg Leu Phe Tyr Asn Ala His Asn
    1890                1895                1900

Lys Thr Leu Phe Ser Val Pro Ile Val Asp Ala Lys Val Lys Met Leu
1905                1910                1915                1920

Phe Ala Glu Lys Asn Ile Gln Val Asn Tyr Asp Arg Ser Leu Thr Ala
                1925                1930                1935

Ile Asp Leu Ser Lys Arg Ile Ala Thr Phe Asn Ser Pro Glu Gly Val
            1940                1945                1950

Val Glu Val Pro Tyr Asp Phe Ile Asn Val Val Pro Pro Met Arg Ala
        1955                1960                1965

Pro Asp Ala Val Arg Gln Ser Ala Leu Ala Trp Gln Glu Gly Lys Trp
    1970                1975                1980

Ala Asn Asp Gly Trp Val Glu Val Glu Lys His Thr Leu Arg His Arg
1985                1990                1995                2000

Arg Tyr Ala Asn Val Phe Ala Val Gly Asp Val Ala Gly Val Pro Lys
                2005                2010                2015

Gly Lys Thr Ala Ala Ser Val Lys Trp Gln Val Pro Val Ala Val Ala
            2020                2025                2030

His Leu Leu Ala Glu Leu Glu Gly Lys Pro Cys Asp Glu Ile Tyr Asn
        2035                2040                2045

Gly Tyr Thr Ser Cys Pro Leu Ile Thr Gln Leu Gly Lys Gly Met Leu
    2050                2055                2060

Val Glu Phe Asp Tyr Asn Asn His Leu Thr Pro Ser Phe Pro Gly Val
2065                2070                2075                2080

Ile Ala Pro Leu Glu Glu Leu Trp Ala Thr Trp Ala Ile Lys Thr Leu
                2085                2090                2095

Gly Leu Lys Pro Thr Tyr Leu Gly Met Leu Arg Gly Leu Ala
            2100                2105                2110


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taccgttctg gctacgtgac aagtgcaatt ggtttaaaaa attcaaaaat cagcaatggc 180

gatcttgaat ttattgtact gtggggaaga actcgcgatc tgtttgtgaa tggggagaaa 240

ccaacccgtt ttagagataa aacaatgtta tcagtcctac ccaatttaat cggaaatcgc 300

ttaagtattc acgacattga ccagttgatc gaaatcttaa atactacgaa taaaaaagcc 360

acagtgaatg tggttgcaag tgaagaaaaa ggcagctcaa atctaaatat tgaaagacaa 420

tatgatgttt ttccgcaagt gagtgtcgga ttcaataatt caggtgctgg caataatgcc 480

aatgggcgta atcaagctac attgaatatt gcttggagtg atctattagg cacgaatgat 540

cgttggagtt tctcgagtag ttaccgttta tataaaaatc atcatgctaa ccagcaacgc 600

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gaatctacgt atgaaaaaga acttcgcggt ataaatactc attcttctca tgggaaaacc 720

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aaatatcaca ataataaagt gagcgtaggg ttatcttaca tgactaattt tgcttacggg 900

aagctttaca gcgacattgc ttacgcgaat gggttgagat ggtttggggc gaattattca 960

gcatatgatg caaatcgtga aaaaacctta aaattattgt caggaagtat taattggcag 1020

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tcttttttaat ctcttttaag tttaaggatt aacttaat atg aac aaa aat cgt tac 1496
Met Asn Lys Asn Arg Tyr
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aaa ctc att ttt agt caa gtc aaa ggt tgt ctc gtt cct gtg gca gaa 1544
Lys Leu Ile Phe Ser Gln Val Lys Gly Cys Leu Val Pro Val Ala Glu
10 15 20

tgt att aac tca gct att agc aat ggt tca tct gat tca aca tcc aca 1592
Cys Ile Asn Ser Ala Ile Ser Asn Gly Ser Ser Asp Ser Thr Ser Thr
25 30 35

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tca gaa caa gtt gaa gag gaa cct ttc ctt cta gaa caa tat tca ctt   1640
Ser Glu Gln Val Glu Glu Glu Pro Phe Leu Leu Glu Gln Tyr Ser Leu
     40                  45                  50

tcc tcc gtg tct tta tta gta aaa agc acg ttc aat cct gtt tcg tat   1688
Ser Ser Val Ser Leu Leu Val Lys Ser Thr Phe Asn Pro Val Ser Tyr
 55                  60                  65                  70

gca atg caa ttg act tgg aaa cag ctt tct att tta ttt tta act gtg   1736
Ala Met Gln Leu Thr Trp Lys Gln Leu Ser Ile Leu Phe Leu Thr Val
                 75                  80                  85

att tct gtt cct gtt ttg gct gag gga aaa ggg gat gaa aga aat caa   1784
Ile Ser Val Pro Val Leu Ala Glu Gly Lys Gly Asp Glu Arg Asn Gln
             90                  95                 100

tta aca gtg att gat aat agc gat cat att aaa tta gat gca tct aat   1832
Leu Thr Val Ile Asp Asn Ser Asp His Ile Lys Leu Asp Ala Ser Asn
        105                 110                 115

ctt gct ggt aat gat aaa aca aaa atc tat caa gca gaa aat aaa gtt   1880
Leu Ala Gly Asn Asp Lys Thr Lys Ile Tyr Gln Ala Glu Asn Lys Val
    120                 125                 130

ctg gtt att gat att gct aaa cca aat ggg aaa ggg att tca gat aac   1928
Leu Val Ile Asp Ile Ala Lys Pro Asn Gly Lys Gly Ile Ser Asp Asn
135                 140                 145                 150

cgt ttt gaa aaa ttt aat att cca aat agc gcg gtg ttt aat aat aat   1976
Arg Phe Glu Lys Phe Asn Ile Pro Asn Ser Ala Val Phe Asn Asn Asn
                155                 160                 165

ggg act gaa gcg cag gca aga tca aca tta att ggt tac att ccg caa   2024
Gly Thr Glu Ala Gln Ala Arg Ser Thr Leu Ile Gly Tyr Ile Pro Gln
            170                 175                 180

aat caa aat tta agg gga ggg aaa gaa gct gat gtt ata tta aat caa   2072
Asn Gln Asn Leu Arg Gly Gly Lys Glu Ala Asp Val Ile Leu Asn Gln
        185                 190                 195

gtg aca ggt cct caa gaa agt aaa att gtt ggc gcg ctt gaa gta tta   2120
Val Thr Gly Pro Gln Glu Ser Lys Ile Val Gly Ala Leu Glu Val Leu
    200                 205                 210

ggt aaa aaa gct gat atc gtc att gca aac caa aat ggt att acc tta   2168
Gly Lys Lys Ala Asp Ile Val Ile Ala Asn Gln Asn Gly Ile Thr Leu
215                 220                 225                 230

aat ggt gta aga aca ata aat tca gat cgt ttt gtt gcc act acg agt   2216
Asn Gly Val Arg Thr Ile Asn Ser Asp Arg Phe Val Ala Thr Thr Ser
                235                 240                 245

gag ctt ata gat ccg aat cag atg atg tta aag gtt aca aaa gga aat   2264
Glu Leu Ile Asp Pro Asn Gln Met Met Leu Lys Val Thr Lys Gly Asn
            250                 255                 260

gtg atc att gat att gat ggt ttt tcg aca gat gga tta aag tat tta   2312
Val Ile Ile Asp Ile Asp Gly Phe Ser Thr Asp Gly Leu Lys Tyr Leu
        265                 270                 275

gat att att gct aaa aaa att gaa caa aag caa tca att aca tca ggg   2360
Asp Ile Ile Ala Lys Lys Ile Glu Gln Lys Gln Ser Ile Thr Ser Gly
    280                 285                 290
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gat aat tca gaa gca aaa aca gat gtc act ctt att gcg ggt tcc agt   2408
Asp Asn Ser Glu Ala Lys Thr Asp Val Thr Leu Ile Ala Gly Ser Ser
295                 300                 305                 310

gaa tat gat tta agc aaa cat gag ctg aaa aaa acg agc ggt gaa aat   2456
Glu Tyr Asp Leu Ser Lys His Glu Leu Lys Lys Thr Ser Gly Glu Asn
                315                 320                 325

gta tct aat gat gtt att gct atc acg gga tct agt aca ggc gca atg   2504
Val Ser Asn Asp Val Ile Ala Ile Thr Gly Ser Ser Thr Gly Ala Met
            330                 335                 340

cat ggt aaa aat att aag ttg att gtg aca gat aaa ggt gca ggc gta   2552
His Gly Lys Asn Ile Lys Leu Ile Val Thr Asp Lys Gly Ala Gly Val
        345                 350                 355

aaa cat gat gga att att ttg tct gaa aat gat att cag att gaa atg   2600
Lys His Asp Gly Ile Ile Leu Ser Glu Asn Asp Ile Gln Ile Glu Met
    360                 365                 370

aat gaa ggt gac tta gaa ctt ggc aat acg att cag caa aca gtg gta   2648
Asn Glu Gly Asp Leu Glu Leu Gly Asn Thr Ile Gln Gln Thr Val Val
375                 380                 385                 390

aaa aaa gac cga aat att cga gcc aag aaa aaa att gaa gtg aaa aac   2696
Lys Lys Asp Arg Asn Ile Arg Ala Lys Lys Lys Ile Glu Val Lys Asn
                395                 400                 405

gct aat cgt gtt ttt gtt ggt agt caa acg aaa tca gat gaa att tcg   2744
Ala Asn Arg Val Phe Val Gly Ser Gln Thr Lys Ser Asp Glu Ile Ser
            410                 415                 420

tta gag gcg aaa caa gtt aaa atc aga aaa aac gca gag att agg agt   2792
Leu Glu Ala Lys Gln Val Lys Ile Arg Lys Asn Ala Glu Ile Arg Ser
        425                 430                 435


acg aca caa gcc aaa atc gta gca aag ggt gcc ctg tct att gag caa   2840
Thr Thr Gln Ala Lys Ile Val Ala Lys Gly Ala Leu Ser Ile Glu Gln
    440                 445                 450

aat gcg aag ctc gtc gct aaa aag ata gat gtg gca aca gaa act cta   2888
Asn Ala Lys Leu Val Ala Lys Lys Ile Asp Val Ala Thr Glu Thr Leu
455                 460                 465                 470

act aat gct ggg cgt att tat ggt cga gag gtt aag ctt gac act aat   2936
Thr Asn Ala Gly Arg Ile Tyr Gly Arg Glu Val Lys Leu Asp Thr Asn
                475                 480                 485

aat ttg att aat gat aaa gaa att tat gct gaa cgg aaa ttg agt att   2984
Asn Leu Ile Asn Asp Lys Glu Ile Tyr Ala Glu Arg Lys Leu Ser Ile
            490                 495                 500

ttg acg aaa gga aaa gat ctt gaa att att caa gat aga tat ttg tct   3032
Leu Thr Lys Gly Lys Asp Leu Glu Ile Ile Gln Asp Arg Tyr Leu Ser
        505                 510                 515

cca ctg atg cgc gta aaa agt agt gtc cgc ttt tta ggc tct ccg ttt   3080
Pro Leu Met Arg Val Lys Ser Ser Val Arg Phe Leu Gly Ser Pro Phe
    520                 525                 530

ttc tca ata tct ccg tcg atg ctc gca agc ctt agt gca cag ttt aag   3128
Phe Ser Ile Ser Pro Ser Met Leu Ala Ser Leu Ser Ala Gln Phe Lys
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535                 540                 545                 550

cct ggt ttt gtg aat aag gga ctc att gaa agt gcg ggg agt gca gaa   3176
Pro Gly Phe Val Asn Lys Gly Leu Ile Glu Ser Ala Gly Ser Ala Glu
                555                 560                 565

tta act ttt aaa gaa aaa acc agt ttt tta aca gag ggc aat aat ttt   3224
Leu Thr Phe Lys Glu Lys Thr Ser Phe Leu Thr Glu Gly Asn Asn Phe
            570                 575                 580

att aga gct aaa gat gcg tta ac                                   3247
Ile Arg Ala Lys Asp Ala Leu
        585
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Leu Val Pro Val Ala Glu Cys Ile Asn Ser Ala Ile Ser Asn Gly Ser
             20                  25                  30

Ser Asp Ser Thr Ser Thr Ser Glu Gln Val Glu Glu Glu Pro Phe Leu
         35                  40                  45

Leu Glu Gln Tyr Ser Leu Ser Ser Val Ser Leu Leu Val Lys Ser Thr
     50                  55                  60

Phe Asn Pro Val Ser Tyr Ala Met Gln Leu Thr Trp Lys Gln Leu Ser
 65                  70                  75                  80

Ile Leu Phe Leu Thr Val Ile Ser Val Pro Val Leu Ala Glu Gly Lys
                 85                  90                  95

Gly Asp Glu Arg Asn Gln Leu Thr Val Ile Asp Asn Ser Asp His Ile
            100                 105                 110

Lys Leu Asp Ala Ser Asn Leu Ala Gly Asn Asp Lys Thr Lys Ile Tyr
        115                 120                 125

Gln Ala Glu Asn Lys Val Leu Val Ile Asp Ile Ala Lys Pro Asn Gly
    130                 135                 140

Lys Gly Ile Ser Asp Asn Arg Phe Glu Lys Phe Asn Ile Pro Asn Ser
145                 150                 155                 160

Ala Val Phe Asn Asn Asn Gly Thr Glu Ala Gln Ala Arg Ser Thr Leu
                165                 170                 175

Ile Gly Tyr Ile Pro Gln Asn Gln Asn Leu Arg Gly Gly Lys Glu Ala
            180                 185                 190

Asp Val Ile Leu Asn Gln Val Thr Gly Pro Gln Glu Ser Lys Ile Val
        195                 200                 205

Gly Ala Leu Glu Val Leu Gly Lys Lys Ala Asp Ile Val Ile Ala Asn
    210                 215                 220
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Gln Asn Gly Ile Thr Leu Asn Gly Val Arg Thr Ile Asn Ser Asp Arg
225                 230                 235                 240

Phe Val Ala Thr Thr Ser Glu Leu Ile Asp Pro Asn Gln Met Met Leu
                245                 250                 255

Lys Val Thr Lys Gly Asn Val Ile Ile Asp Ile Asp Gly Phe Ser Thr
            260                 265                 270

Asp Gly Leu Lys Tyr Leu Asp Ile Ile Ala Lys Lys Ile Glu Gln Lys
        275                 280                 285

Gln Ser Ile Thr Ser Gly Asp Asn Ser Glu Ala Lys Thr Asp Val Thr
    290                 295                 300

Leu Ile Ala Gly Ser Ser Glu Tyr Asp Leu Ser Lys His Glu Leu Lys
305                 310                 315                 320

Lys Thr Ser Gly Glu Asn Val Ser Asn Asp Val Ile Ala Ile Thr Gly
                325                 330                 335

Ser Ser Thr Gly Ala Met His Gly Lys Asn Ile Lys Leu Ile Val Thr
            340                 345                 350

Asp Lys Gly Ala Gly Val Lys His Asp Gly Ile Ile Leu Ser Glu Asn
        355                 360                 365

Asp Ile Gln Ile Glu Met Asn Glu Gly Asp Leu Glu Leu Gly Asn Thr
    370                 375                 380

Ile Gln Gln Thr Val Val Lys Lys Asp Arg Asn Ile Arg Ala Lys Lys
385                 390                 395                 400

Lys Ile Glu Val Lys Asn Ala Asn Arg Val Phe Val Gly Ser Gln Thr
                405                 410                 415

Lys Ser Asp Glu Ile Ser Leu Glu Ala Lys Gln Val Lys Ile Arg Lys
            420                 425                 430

Asn Ala Glu Ile Arg Ser Thr Thr Gln Ala Lys Ile Val Ala Lys Gly
        435                 440                 445

Ala Leu Ser Ile Glu Gln Asn Ala Lys Leu Val Ala Lys Lys Ile Asp
    450                 455                 460

Val Ala Thr Glu Thr Leu Thr Asn Ala Gly Arg Ile Tyr Gly Arg Glu
465                 470                 475                 480

Val Lys Leu Asp Thr Asn Asn Leu Ile Asn Asp Lys Glu Ile Tyr Ala
                485                 490                 495

Glu Arg Lys Leu Ser Ile Leu Thr Lys Gly Lys Asp Leu Glu Ile Ile
            500                 505                 510

Gln Asp Arg Tyr Leu Ser Pro Leu Met Arg Val Lys Ser Ser Val Arg
        515                 520                 525

Phe Leu Gly Ser Pro Phe Phe Ser Ile Ser Pro Ser Met Leu Ala Ser
    530                 535                 540

Leu Ser Ala Gln Phe Lys Pro Gly Phe Val Asn Lys Gly Leu Ile Glu
545                 550                 555                 560
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Ser Ala Gly Ser Ala Glu Leu Thr Phe Lys Glu Lys Thr Ser Phe Leu
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Thr Glu Gly Asn Asn Phe Ile Arg Ala Lys Asp Ala Leu
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Val Asp Leu Ala Gly Glu Lys Val Ser Leu Asn Phe Gly Asp Ile Ile
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cat gct tac caa aac cag ccc cta tca aca aaa gtt gtt ttt caa tta   96
His Ala Tyr Gln Asn Gln Pro Leu Ser Thr Lys Val Val Phe Gln Leu
            20                  25                  30

gtg aaa gat ttg acg gaa gtt tta tac cgt tct ggc tac gtg aca agt   144
Val Lys Asp Leu Thr Glu Val Leu Tyr Arg Ser Gly Tyr Val Thr Ser
        35                  40                  45

gca att ggt tta aaa aat tca aaa atc agc aat ggc gat ctt gaa ttt   192
Ala Ile Gly Leu Lys Asn Ser Lys Ile Ser Asn Gly Asp Leu Glu Phe
    50                  55                  60

att gta ctg tgg gga aga act cgc gat ctg ttt gtg aat ggg gag aaa   240
Ile Val Leu Trp Gly Arg Thr Arg Asp Leu Phe Val Asn Gly Glu Lys
65                  70                  75                  80

cca acc cgt ttt aga gat aaa aca atg tta tca gtc cta ccc aat tta   288
Pro Thr Arg Phe Arg Asp Lys Thr Met Leu Ser Val Leu Pro Asn Leu
                85                  90                  95

atc gga aat cgc tta agt att cac gac att gac cag ttg atc gaa atc   336
Ile Gly Asn Arg Leu Ser Ile His Asp Ile Asp Gln Leu Ile Glu Ile
            100                 105                 110

tta aat act acg aat aaa aaa gcc aca gtg aat gtg gtt gca agt gaa   384
Leu Asn Thr Thr Asn Lys Lys Ala Thr Val Asn Val Val Ala Ser Glu
        115                 120                 125

gaa aaa ggc agc tca aat cta aat att gaa aga caa tat gat gtt ttt   432
Glu Lys Gly Ser Ser Asn Leu Asn Ile Glu Arg Gln Tyr Asp Val Phe
    130                 135                 140

ccg caa gtg agt gtc gga ttc aat aat tca ggt gct ggc aat aat gcc   480
Pro Gln Val Ser Val Gly Phe Asn Asn Ser Gly Ala Gly Asn Asn Ala
145                 150                 155                 160

aat ggg cgt aat caa gct aca ttg aat att gct tgg agt gat cta tta   528
Asn Gly Arg Asn Gln Ala Thr Leu Asn Ile Ala Trp Ser Asp Leu Leu
                165                 170                 175
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ggc acg aat gat cgt tgg agt ttc tcg agt agt tac cgt tta tat aaa   576
Gly Thr Asn Asp Arg Trp Ser Phe Ser Ser Ser Tyr Arg Leu Tyr Lys
            180                 185                 190

aat cat cat gct aac cag caa cgc aat tat act ttg tct tac agt cag   624
Asn His His Ala Asn Gln Gln Arg Asn Tyr Thr Leu Ser Tyr Ser Gln
        195                 200                 205

cct ata ggc ttt tct aca gta gaa att aaa gca tcg gaa tct acg tat   672
Pro Ile Gly Phe Ser Thr Val Glu Ile Lys Ala Ser Glu Ser Thr Tyr
    210                 215                 220

gaa aaa gaa ctt cgc ggt ata aat act cat tct tct cat ggg aaa acc   720
Glu Lys Glu Leu Arg Gly Ile Asn Thr His Ser Ser His Gly Lys Thr
225                 230                 235                 240

caa agc tta gct gtc aag ctg atg cat gtg tta ttg cgt aat aag gag   768
Gln Ser Leu Ala Val Lys Leu Met His Val Leu Leu Arg Asn Lys Glu
                245                 250                 255

agt att tta tct aca tat acc gag ttc gag ttt aaa aaa cgg att agt   816
Ser Ile Leu Ser Thr Tyr Thr Glu Phe Glu Phe Lys Lys Arg Ile Ser
            260                 265                 270

tat ttt tct gat att ttg att ggg aaa tat cac aat aat aaa gtg agc   864
Tyr Phe Ser Asp Ile Leu Ile Gly Lys Tyr His Asn Asn Lys Val Ser
        275                 280                 285


gta ggg tta tct tac atg act aat ttt gct tac ggg aag ctt tac agc   912
Val Gly Leu Ser Tyr Met Thr Asn Phe Ala Tyr Gly Lys Leu Tyr Ser
    290                 295                 300

gac att gct tac gcg aat ggg ttg aga tgg ttt ggg gcg aat tat tca   960
Asp Ile Ala Tyr Ala Asn Gly Leu Arg Trp Phe Gly Ala Asn Tyr Ser
305                 310                 315                 320

gca tat gat gca aat cgt gaa aaa acc tta aaa tta ttg tca gga agt  1008
Ala Tyr Asp Ala Asn Arg Glu Lys Thr Leu Lys Leu Leu Ser Gly Ser
                325                 330                 335

att aat tgg cag cgt cca ata tcc ctg ttt gaa cgt gcg atg aat tat  1056
Ile Asn Trp Gln Arg Pro Ile Ser Leu Phe Glu Arg Ala Met Asn Tyr
            340                 345                 350

caa tta cgt att ggt gcc caa tat ggt ttt gat agt ttg tat tct gaa  1104
Gln Leu Arg Ile Gly Ala Gln Tyr Gly Phe Asp Ser Leu Tyr Ser Glu
        355                 360                 365

aat caa ttt tca att ggt gat gaa tat aca gta aga gga ttt aaa ggt  1152
Asn Gln Phe Ser Ile Gly Asp Glu Tyr Thr Val Arg Gly Phe Lys Gly
    370                 375                 380

ggt gcg gtt tct ggt gat agt ggt gcg tat tta tca caa aca ctg acg  1200
Gly Ala Val Ser Gly Asp Ser Gly Ala Tyr Leu Ser Gln Thr Leu Thr
385                 390                 395                 400

gtt cct ttt tat cca caa aaa gca tat tta tct cag gta tcc cct ttt  1248
Val Pro Phe Tyr Pro Gln Lys Ala Tyr Leu Ser Gln Val Ser Pro Phe
                405                 410                 415

att gga ttt gat atg ggt aaa gta cat att aaa tca aag cat aaa aca  1296
Ile Gly Phe Asp Met Gly Lys Val His Ile Lys Ser Lys His Lys Thr
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            420                 425                 430

acc act tta gtc ggt ttt gcc cta ggc ttg aaa acg caa ata aag tta   1344
Thr Thr Leu Val Gly Phe Ala Leu Gly Leu Lys Thr Gln Ile Lys Leu
        435                 440                 445

ttt tca tta tca tta acc tat gca caa cca atg aat ggt gtg agt ggt   1392
Phe Ser Leu Ser Leu Thr Tyr Ala Gln Pro Met Asn Gly Val Ser Gly
    450                 455                 460

gtt acg caa cat cgt caa aaa ccg att tat tat ttc tca gga tca ctt   1440
Val Thr Gln His Arg Gln Lys Pro Ile Tyr Tyr Phe Ser Gly Ser Leu
465                 470                 475                 480

tct ttt taatctcttt taagtttaag gattaactta atatgaacaa aaatcgttac    1496
Ser Phe

aaactcattt ttagtcaagt caaaggttgt ctcgttcctg tggcagaatg tattaactca 1556

gctattagca atggttcatc tgattcaaca tccacatcag aacaagttga agaggaacct 1616

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cctgtttcgt atgcaatgca attgacttgg aaacagcttt ctattttatt tttaactgtg 1736

atttctgttc ctgttttggc tgagggaaaa ggggatgaaa gaaatcaatt aacagtgatt 1796

gataatagcg atcatattaa attagatgca tctaatcttg ctggtaatga taaaacaaaa 1856

atctatcaag cagaaaataa agttctggtt attgatattg ctaaaccaaa tgggaaaggg 1916

atttcagata accgttttga aaaatttaat attccaaata gcgcggtgtt taataataat 1976

gggactgaag cgcaggcaag atcaacatta attggttaca ttccgcaaaa tcaaaattta 2036

aggggaggga aagaagctga tgttatatta aatcaagtga caggtcctca agaaagtaaa 2096

attgttggcg cgcttgaagt attaggtaaa aaagctgata tcgtcattgc aaaccaaaat 2156

ggtattacct taaatggtgt aagaacaata aattcagatc gttttgttgc cactacgagt 2216

gagcttatag atccgaatca gatgatgtta aaggttacaa aaggaaatgt gatcattgat 2276

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gcgggttcca gtgaatatga tttaagcaaa catgagctga aaaaaacgag cggtgaaaat 2456

gtatctaatg atgttattgc tatcacggga tctagtacag gcgcaatgca tggtaaaaat 2516

attaagttga ttgtgacaga taaaggtgca ggcgtaaaac atgatggaat tattttgtct 2576

gaaaatgata ttcagattga aatgaatgaa ggtgacttag aacttggcaa tacgattcag 2636

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gctaatcgtg tttttgttgg tagtcaaacg aaatcagatg aaatttcgtt agaggcgaaa 2756

caagttaaaa tcagaaaaaa cgcagagatt aggagtacga cacaagccaa aatcgtagca 2816

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acagaaactc taactaatgc tgggcgtatt tatggtcgag aggttaagct tgacactaat 2936

aatttgatta atgataaaga aatttatgct gaacggaaat tgagtatttt gacgaaagga 2996

aaagatcttg aaattattca agatagatat ttgtctccac tgatgcgcgt aaaaagtagt 3056

gtccgctttt taggctctcc gtttttctca atatctccgt cgatgctcgc aagccttagt 3116

gcacagttta agcctggttt tgtgaataag ggactcattg aaagtgcggg gagtgcagaa 3176

ttaactttta aagaaaaaac cagtttttta acagagggca ataattttat tagagctaaa 3236

gatgcgttaa c 3247

<210> 20
<211> 482
<212> PRT
<213> Pasteurella multocida

<400> 20

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Val Asp Leu Ala Gly Glu Lys Val Ser Leu Asn Phe Gly Asp Ile Ile
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His Ala Tyr Gln Asn Gln Pro Leu Ser Thr Lys Val Val Phe Gln Leu
            20                  25                  30

Val Lys Asp Leu Thr Glu Val Leu Tyr Arg Ser Gly Tyr Val Thr Ser
        35                  40                  45

Ala Ile Gly Leu Lys Asn Ser Lys Ile Ser Asn Gly Asp Leu Glu Phe
    50                  55                  60

Ile Val Leu Trp Gly Arg Thr Arg Asp Leu Phe Val Asn Gly Glu Lys
65                  70                  75                  80

Pro Thr Arg Phe Arg Asp Lys Thr Met Leu Ser Val Leu Pro Asn Leu
                85                  90                  95

Ile Gly Asn Arg Leu Ser Ile His Asp Ile Asp Gln Leu Ile Glu Ile
            100                 105                 110

Leu Asn Thr Thr Asn Lys Lys Ala Thr Val Asn Val Val Ala Ser Glu
        115                 120                 125

Glu Lys Gly Ser Ser Asn Leu Asn Ile Glu Arg Gln Tyr Asp Val Phe
    130                 135                 140

Pro Gln Val Ser Val Gly Phe Asn Asn Ser Gly Ala Gly Asn Asn Ala
145                 150                 155                 160

Asn Gly Arg Asn Gln Ala Thr Leu Asn Ile Ala Trp Ser Asp Leu Leu
                165                 170                 175

Gly Thr Asn Asp Arg Trp Ser Phe Ser Ser Ser Tyr Arg Leu Tyr Lys
            180                 185                 190

Asn His His Ala Asn Gln Gln Arg Asn Tyr Thr Leu Ser Tyr Ser Gln
        195                 200                 205

Pro Ile Gly Phe Ser Thr Val Glu Ile Lys Ala Ser Glu Ser Thr Tyr
    210                 215                 220
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Glu Lys Glu Leu Arg Gly Ile Asn Thr His Ser Ser His Gly Lys Thr
225                 230                 235                 240

Gln Ser Leu Ala Val Lys Leu Met His Val Leu Leu Arg Asn Lys Glu
                245                 250                 255

Ser Ile Leu Ser Thr Tyr Thr Glu Phe Glu Phe Lys Lys Arg Ile Ser
            260                 265                 270

Tyr Phe Ser Asp Ile Leu Ile Gly Lys Tyr His Asn Asn Lys Val Ser
        275                 280                 285

Val Gly Leu Ser Tyr Met Thr Asn Phe Ala Tyr Gly Lys Leu Tyr Ser
    290                 295                 300

Asp Ile Ala Tyr Ala Asn Gly Leu Arg Trp Phe Gly Ala Asn Tyr Ser
305                 310                 315                 320

Ala Tyr Asp Ala Asn Arg Glu Lys Thr Leu Lys Leu Leu Ser Gly Ser
                325                 330                 335

Ile Asn Trp Gln Arg Pro Ile Ser Leu Phe Glu Arg Ala Met Asn Tyr
            340                 345                 350

Gln Leu Arg Ile Gly Ala Gln Tyr Gly Phe Asp Ser Leu Tyr Ser Glu
        355                 360                 365

Asn Gln Phe Ser Ile Gly Asp Glu Tyr Thr Val Arg Gly Phe Lys Gly
    370                 375                 380

Gly Ala Val Ser Gly Asp Ser Gly Ala Tyr Leu Ser Gln Thr Leu Thr
385                 390                 395                 400

Val Pro Phe Tyr Pro Gln Lys Ala Tyr Leu Ser Gln Val Ser Pro Phe
                405                 410                 415

Ile Gly Phe Asp Met Gly Lys Val His Ile Lys Ser Lys His Lys Thr
            420                 425                 430

Thr Thr Leu Val Gly Phe Ala Leu Gly Leu Lys Thr Gln Ile Lys Leu
        435                 440                 445

Phe Ser Leu Ser Leu Thr Tyr Ala Gln Pro Met Asn Gly Val Ser Gly
    450                 455                 460

Val Thr Gln His Arg Gln Lys Pro Ile Tyr Tyr Phe Ser Gly Ser Leu
465                 470                 475                 480

Ser Phe
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<210> 21
<211> 1170
<212> DNA
<213> Pasteurella multocida

<220>
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<222> (639)..(1022)

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<223> greA

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gtacgataag atcgccatgc atttcattgt tttttatttt tccattggtt aatagactgg 180

tttcaaattg aaattggtca cttagtacga gtttggcggt taaggcggtg agcacttttt 240

gtgtactggc gggtaacata aaggtactgg cttggtgcgc tacaattttt tcattacgat 300

ttaagttttt agccacaaaa cctaggctgg tcccttcggg taaatgagcg ttgatttcag 360

caagatcaat ctcagcataa ctgaaatgac tgacgagtaa actacatata agtatcgttc 420

gtttgaaaag gcgtaaaagc gtggcagtaa aaaaagaaga tattttatac ataattggct 480

cgagcagttg ctatttttt attgtcgaac aataatagta tttgaaccct cgagagtaaa 540

tccttttctc gttaaacact tatttttta ttcaactacg gcattgtttt tacaatgttg 600

tggttttgtt tttatctaaa aaggaagaaa aaacgatt atg aaa cag att cca atg 656
Met Lys Gln Ile Pro Met
1 5

act ata cgt ggt gcg gaa caa tta aga caa gaa ctc gat ttt ttg aaa 704
Thr Ile Arg Gly Ala Glu Gln Leu Arg Gln Glu Leu Asp Phe Leu Lys
10 15 20

aac act cgt cgc cca gaa att att aat gct atc gca gaa gct cgt gaa 752
Asn Thr Arg Arg Pro Glu Ile Ile Asn Ala Ile Ala Glu Ala Arg Glu
25 30 35

cat ggc gat cta aaa gaa aat gca gaa tac cat gct gcg cgt gaa cag 800
His Gly Asp Leu Lys Glu Asn Ala Glu Tyr His Ala Ala Arg Glu Gln
40 45 50

caa gga ttt tgt gaa gga cga atc caa gaa att gaa ggg aaa tta gcg 848
Gln Gly Phe Cys Glu Gly Arg Ile Gln Glu Ile Glu Gly Lys Leu Ala
55 60 65 70

aat agt caa att att gat gtc aca aag atc cca aat aat ggc aaa gtg 896
Asn Ser Gln Ile Ile Asp Val Thr Lys Ile Pro Asn Asn Gly Lys Val
75 80 85

att ttt ggt gcc aca att ttg tta ctg aat att gac acg gaa gaa gaa 944
Ile Phe Gly Ala Thr Ile Leu Leu Leu Asn Ile Asp Thr Glu Glu Glu
90 95 100

gtc tcg tac caa att gta ggc gat gat gaa gcc aat att aaa gca ggg 992
Val Ser Tyr Gln Ile Val Gly Asp Asp Glu Ala Asn Ile Lys Ala Gly
105 110 115

cta att tca gtt aac gcc acg cga ttg aat tagagaaagc taaatggatt 1042
Leu Ile Ser Val Asn Ala Thr Arg Leu Asn
120 125

gcccaagatc ttggcgtcaa acaaacgtta attgacactt ccgtcattaa agcgattacg 1102

caaaatgcct taatggacga acaggcaaga attgagcaac atggcagtac accgaatact 1162

ttcgttga 1170

<210> 22
<211> 128
<212> PRT
<213> Pasteurella multocida

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Glu Leu Asp Phe Leu Lys Asn Thr Arg Arg Pro Glu Ile Ile Asn Ala
20 25 30

Ile Ala Glu Ala Arg Glu His Gly Asp Leu Lys Glu Asn Ala Glu Tyr
35 40 45

His Ala Ala Arg Glu Gln Gln Gly Phe Cys Glu Gly Arg Ile Gln Glu
50 55 60

Ile Glu Gly Lys Leu Ala Asn Ser Gln Ile Ile Asp Val Thr Lys Ile
65 70 75 80

Pro Asn Asn Gly Lys Val Ile Phe Gly Ala Thr Ile Leu Leu Leu Asn
85 90 95

Ile Asp Thr Glu Glu Glu Val Ser Tyr Gln Ile Val Gly Asp Asp Glu
100 105 110

Ala Asn Ile Lys Ala Gly Leu Ile Ser Val Asn Ala Thr Arg Leu Asn
115 120 125

<210> 23
<211> 4666
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (980)..(2440)

<220>
<223> guaB

<400> 23
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tcatcaattc ctgcttgttc aaaatgttgt aaacgtgcaa tcaacttttt acctaattct 120

gcgatcaatt tattccgatc aatcgttggt aatacttcaa tcagctctgc ccaaggttga 180

tcaatttgct gtgtttgttt tgggaaagac aaattaatgc caaagccaat cacgagatta 240

tgttgattat tctgacgatt ggcgatttcg accaaaatcc ctgctaattt gcgcccatgt 300

aatagcacat catttggcca ttttaatcca atgttcaaag cacctgcttg ctttagcgtt 360

tctgcgattg ccatacccac tactaaactc aagccttcta aattgacctt ttggtcacat 420

gcccaataca aactcataat cacttgtcca gcaaaaggag aaagccattg acgaccacgt 480

cgtccacgtc ccgcagtttg atattctgct aagcaaatag cgccttttttc caaatgtgca 540

atattgtcaa gcaagaattg attggtcgag ttaataatcg gcttaatata aagtgggtaa 600

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ggtgctaacg cttgcgtcaa ataagattca tttaagcgac ttaattgagg tatgagacga 660

aaatgttgga cttgctgttc tatttgtatc ccttgttgtt tcaatttttc gatattgtgt 720

aagatatctt gttctgaata acctaaaagt gcagtcaatt ctgctaaaga aagttgttga 780

tagctagcga gtaatgcaag tacgttttgc ataaaaatcc ttatttatat aaccaaagag 840

aggcaactta ttatagacaa tgattttctc gaaaatcgat aaaaaaatcc attttcaaac 900

agcaacgaaa tctgtataat gcgaccgcaa tatttttttac ccttttattt ttcatatcaa 960

cctaagagag aatattgca atg tta cga gta ata aaa gaa gca tta acc ttc  1012
                    Met Leu Arg Val Ile Lys Glu Ala Leu Thr Phe
                      1               5                  10

gat gat gtt ttg ctt gtc cca gca cat tct act gtg ctc cca aat acc   1060
Asp Asp Val Leu Leu Val Pro Ala His Ser Thr Val Leu Pro Asn Thr
            15                  20                  25

gca gac ctt tcc act caa ctc acc aaa act atc cgc ctc aat atc cca   1108
Ala Asp Leu Ser Thr Gln Leu Thr Lys Thr Ile Arg Leu Asn Ile Pro
        30                  35                  40

atg tta tcc gcc gcc atg gat acc gtg aca gaa act aaa ctg gca atc   1156
Met Leu Ser Ala Ala Met Asp Thr Val Thr Glu Thr Lys Leu Ala Ile
    45                  50                  55

tct ctt gca caa gaa ggt ggc atc ggg ttt att cat aaa aat atg tct   1204
Ser Leu Ala Gln Glu Gly Gly Ile Gly Phe Ile His Lys Asn Met Ser
60                  65                  70                  75

att gag cgt caa gcg gaa cgt gtc cgc aaa gtg aaa aaa ttt gag agc   1252
Ile Glu Arg Gln Ala Glu Arg Val Arg Lys Val Lys Lys Phe Glu Ser
                80                  85                  90

ggt att gta tcc gat cct gtc acc gtt tca cca acc tta tct tta gca   1300
Gly Ile Val Ser Asp Pro Val Thr Val Ser Pro Thr Leu Ser Leu Ala
            95                  100                 105

gaa tta agt gaa tta gtg aag aaa aat ggt ttt gcg agt ttc cct gtt   1348
Glu Leu Ser Glu Leu Val Lys Lys Asn Gly Phe Ala Ser Phe Pro Val
        110                 115                 120

gtt gat gat gaa aaa aat ctt gtc ggt atc att act ggt cgt gat aca   1396
Val Asp Asp Glu Lys Asn Leu Val Gly Ile Ile Thr Gly Arg Asp Thr
    125                 130                 135

cgc ttt gtc acg gat tta aat aaa aca gtg gcg gac ttt atg acc cct   1444
Arg Phe Val Thr Asp Leu Asn Lys Thr Val Ala Asp Phe Met Thr Pro
140                 145                 150                 155

aaa gct cgt ctt gtc acg gtg aaa cgc aat gca agt cgc gat gaa att   1492
Lys Ala Arg Leu Val Thr Val Lys Arg Asn Ala Ser Arg Asp Glu Ile
                160                 165                 170

ttt ggt cta atg cat aca cac cgt gta gaa aaa gtc ctt gtt gtc agc   1540
Phe Gly Leu Met His Thr His Arg Val Glu Lys Val Leu Val Val Ser
            175                 180                 185

gac gat ttc aaa tta aaa ggc atg atc acc tta aaa gac tac caa aaa   1588
Asp Asp Phe Lys Leu Lys Gly Met Ile Thr Leu Lys Asp Tyr Gln Lys
        190                 195                 200
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tcc gag caa aaa cca caa gcc tgt aaa gat gaa ttt ggt cgt tta cgt   1636
Ser Glu Gln Lys Pro Gln Ala Cys Lys Asp Glu Phe Gly Arg Leu Arg
    205                 210                 215

gtc ggt gct gca gta gga gca gga cct ggt aat gaa gaa cgt att gat   1684
Val Gly Ala Ala Val Gly Ala Gly Pro Gly Asn Glu Glu Arg Ile Asp
220                 225                 230                 235

gca tta gtg aaa gca ggg gtc gat gtg tta ttg att gac tca tca cac   1732
Ala Leu Val Lys Ala Gly Val Asp Val Leu Leu Ile Asp Ser Ser His
                240                 245                 250


ggt cat tca gaa ggt gtg tta caa cgt gtg cgt gaa act cgt gcg aaa   1780
Gly His Ser Glu Gly Val Leu Gln Arg Val Arg Glu Thr Arg Ala Lys
            255                 260                 265

tac cca gat ttg cca att gtt gca ggt aat gtg gca acc gct gaa ggc   1828
Tyr Pro Asp Leu Pro Ile Val Ala Gly Asn Val Ala Thr Ala Glu Gly
        270                 275                 280

gca att gcg ttg gct gat gca ggg gca agt gca gtg aaa gtg ggg att   1876
Ala Ile Ala Leu Ala Asp Ala Gly Ala Ser Ala Val Lys Val Gly Ile
    285                 290                 295

ggt cct ggt tca att tgt aca aca cgt att gtc aca ggc gtg ggc gtt   1924
Gly Pro Gly Ser Ile Cys Thr Thr Arg Ile Val Thr Gly Val Gly Val
300                 305                 310                 315

cca caa att aca gcg att gcc gat gcg gca gaa gca cta aaa gat cgg   1972
Pro Gln Ile Thr Ala Ile Ala Asp Ala Ala Glu Ala Leu Lys Asp Arg
                320                 325                 330

ggt att cct gtg att gca gat ggc ggt atc cgt ttc tct ggt gat att   2020
Gly Ile Pro Val Ile Ala Asp Gly Gly Ile Arg Phe Ser Gly Asp Ile
            335                 340                 345

tcg aaa gcc att gcg gcg ggc gcc tct tgt gtt atg gtg ggt tcc atg   2068
Ser Lys Ala Ile Ala Ala Gly Ala Ser Cys Val Met Val Gly Ser Met
        350                 355                 360

ttt gca ggt aca gaa gaa gca cca ggt gaa atc gaa ctt tat caa ggt   2116
Phe Ala Gly Thr Glu Glu Ala Pro Gly Glu Ile Glu Leu Tyr Gln Gly
    365                 370                 375

cgt gcc ttt aaa tct tat cga ggt atg gga tcg tta ggt gcg atg agc   2164
Arg Ala Phe Lys Ser Tyr Arg Gly Met Gly Ser Leu Gly Ala Met Ser
380                 385                 390                 395

aaa ggc tca agc gac cgc tat ttc cag tcc gat aat gca gct gac aaa   2212
Lys Gly Ser Ser Asp Arg Tyr Phe Gln Ser Asp Asn Ala Ala Asp Lys
                400                 405                 410

tta gta cca gaa ggt att gaa gga cgt att cca tat aaa gga ttc tta   2260
Leu Val Pro Glu Gly Ile Glu Gly Arg Ile Pro Tyr Lys Gly Phe Leu
            415                 420                 425

aaa gaa att atc cat caa caa atg ggt gga ttg cgt tct tgt atg ggc   2308
Lys Glu Ile Ile His Gln Gln Met Gly Gly Leu Arg Ser Cys Met Gly
        430                 435                 440

tta acg ggt tgt gca acc att gat gaa ctc cgt acc aaa gcg cag ttt   2356
Leu Thr Gly Cys Ala Thr Ile Asp Glu Leu Arg Thr Lys Ala Gln Phe
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    445                 450                 455

gtg cgc att agt ggt gca ggg atc caa gaa agc cat gtg cat gat gtg   2404
Val Arg Ile Ser Gly Ala Gly Ile Gln Glu Ser His Val His Asp Val
460                 465                 470                 475

act atc aca aaa gaa gcc cct aat tat cgt atg ggt taaacattgc        2450
Thr Ile Thr Lys Glu Ala Pro Asn Tyr Arg Met Gly
                480                 485

ttaggtgggg attatcccca cctaagttta ttttaaataa caacgttaat agagaagctt 2510

atttttatgt atggcattaa aattaaaaat gttattaaac tttttctatt aaagttttta 2570

agaaataaat atcgatataa aatcaatatt caacatcatc tcattagtat tgaaggaaaa 2630

tgcggtgagt ttgatttaag ccagctaaac tatgtttatt tggtgaaaga tcctgagata 2690

agaaataatc gactgacact gtacttgaat gatttttca aaattggggt aaattatcat 2750

ggatttactc aaatgtatca gacactatca tccaagtatg gttttgatga cgcaacgttt 2810

tttgaatatc tttgtaagaa agggcctttt tctattcaaa tttggcgtaa aaaacaaact 2870

caaaattatg tgattcttga tgaagcctat actgactata cacaaggttt tgaaattcaa 2930

tctcctgaaa aaatatttat tccttggggg actacttatg aagccttatt tcagcagaca 2990

caatttaaag aaaaaggaat ctcttatgac tttatcttcc ctattcggat agggcgttta 3050

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tacactgagt gctatcatga atccgcgaca gaaaaaagtt atcaggaatt aaccgccgca 3170

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cgagacgatt ttgatagggg atacactaaa ttcagcatta gagatacgac agactattta 3350

gattatgtga tcaacgagcc ttatgaaaat caattagtga taacggatta tttagtgatt 3410

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ccaaaaataa aagaaaagtt tcgtgatgca caaagcctga tttggacaga tgatctcaat 3530

cataaaatcg gttttaccag tgatgaccgc gctatcgtct ttgataaagc ggacattgaa 3590

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acttaaatga acaacattca caaccataaa attttaattt tggacttcgg ttcacaatat 3950

acccagttga ttgcccgccg tgtacgtgaa attggcgtgt actgcgaact ttgggcatgg 4010

gatgtatccg aagccgatat tcgtgagttt aatccaactg ggattattct ttctggtggt 4070
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cctgaaagta ccactgaaga aaacagccca cgagctcccg aatacgtatt caacgccggt 4130

gtacccgtat tagggatctg ttatggtatg caaaccatgg cgatgcaact aggtggttta 4190

actgaaactt ctactcaccg agaatttggt tatgcatcag tgaatctaaa agccgcggac 4250

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tcaacctgtc caatcgcagc tatgtcggat gaacgtcgtc gtttttatgg tgtccaattc 4430

cacccagaag tgactcatac aaaaagcggg cttgaattat taacgaattt tgtggtgaag 4490

atctgtggtt gtgaacgtaa ctggacacca gaaaatatca ttgaagatgc cgttgctcgt 4550

cttaaagcac aagtgggcga tgatgaagtg attttaggct tatctggtgg cgttaactgc 4610

cgtataggca gcttagaaaa agtgtccgcg ctcacgttaa tccccgtaag cgttga 4666

<210> 24
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<212> PRT
<213> Pasteurella multocida

<400> 24

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Val	Pro	Ala	His	Ser	Thr	Val	Leu	Pro	Asn	Thr	Ala	Asp	Leu	Ser	Thr
			20					25					30		
Gln	Leu	Thr	Lys	Thr	Ile	Arg	Leu	Asn	Ile	Pro	Met	Leu	Ser	Ala	Ala
		35					40					45			
Met	Asp	Thr	Val	Thr	Glu	Thr	Lys	Leu	Ala	Ile	Ser	Leu	Ala	Gln	Glu
	50					55					60				
Gly	Gly	Ile	Gly	Phe	Ile	His	Lys	Asn	Met	Ser	Ile	Glu	Arg	Gln	Ala
65					70					75					80
Glu	Arg	Val	Arg	Lys	Val	Lys	Lys	Phe	Glu	Ser	Gly	Ile	Val	Ser	Asp
			85					90					95		
Pro	Val	Thr	Val	Ser	Pro	Thr	Leu	Ser	Leu	Ala	Glu	Leu	Ser	Glu	Leu
		100					105					110			
Val	Lys	Lys	Asn	Gly	Phe	Ala	Ser	Phe	Pro	Val	Val	Asp	Asp	Glu	Lys
	115					120					125				
Asn	Leu	Val	Gly	Ile	Ile	Thr	Gly	Arg	Asp	Thr	Arg	Phe	Val	Thr	Asp
130					135					140					
Leu	Asn	Lys	Thr	Val	Ala	Asp	Phe	Met	Thr	Pro	Lys	Ala	Arg	Leu	Val
145				150					155						160
Thr	Val	Lys	Arg	Asn	Ala	Ser	Arg	Asp	Glu	Ile	Phe	Gly	Leu	Met	His
			165					170					175		
Thr	His	Arg	Val	Glu	Lys	Val	Leu	Val	Val	Ser	Asp	Asp	Phe	Lys	Leu
		180					185					190			

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Lys Gly Met Ile Thr Leu Lys Asp Tyr Gln Lys Ser Glu Gln Lys Pro
        195                 200                 205

Gln Ala Cys Lys Asp Glu Phe Gly Arg Leu Arg Val Gly Ala Ala Val
    210                 215                 220

Gly Ala Gly Pro Gly Asn Glu Glu Arg Ile Asp Ala Leu Val Lys Ala
225                 230                 235                 240

Gly Val Asp Val Leu Leu Ile Asp Ser Ser His Gly His Ser Glu Gly
                245                 250                 255

Val Leu Gln Arg Val Arg Glu Thr Arg Ala Lys Tyr Pro Asp Leu Pro
            260                 265                 270

Ile Val Ala Gly Asn Val Ala Thr Ala Glu Gly Ala Ile Ala Leu Ala
        275                 280                 285

Asp Ala Gly Ala Ser Ala Val Lys Val Gly Ile Gly Pro Gly Ser Ile
    290                 295                 300

Cys Thr Thr Arg Ile Val Thr Gly Val Gly Val Pro Gln Ile Thr Ala
305                 310                 315                 320

Ile Ala Asp Ala Ala Glu Ala Leu Lys Asp Arg Gly Ile Pro Val Ile
                325                 330                 335

Ala Asp Gly Gly Ile Arg Phe Ser Gly Asp Ile Ser Lys Ala Ile Ala
            340                 345                 350

Ala Gly Ala Ser Cys Val Met Val Gly Ser Met Phe Ala Gly Thr Glu
        355                 360                 365

Glu Ala Pro Gly Glu Ile Glu Leu Tyr Gln Gly Arg Ala Phe Lys Ser
    370                 375                 380

Tyr Arg Gly Met Gly Ser Leu Gly Ala Met Ser Lys Gly Ser Ser Asp
385                 390                 395                 400

Arg Tyr Phe Gln Ser Asp Asn Ala Ala Asp Lys Leu Val Pro Glu Gly
                405                 410                 415

Ile Glu Gly Arg Ile Pro Tyr Lys Gly Phe Leu Lys Glu Ile Ile His
            420                 425                 430

Gln Gln Met Gly Gly Leu Arg Ser Cys Met Gly Leu Thr Gly Cys Ala
        435                 440                 445

Thr Ile Asp Glu Leu Arg Thr Lys Ala Gln Phe Val Arg Ile Ser Gly
    450                 455                 460

Ala Gly Ile Gln Glu Ser His Val His Asp Val Thr Ile Thr Lys Glu
465                 470                 475                 480

Ala Pro Asn Tyr Arg Met Gly
                485
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<210> 25
<211> 2364
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (191)..(1828)

<220>
<223> Hi1501

<400> 25
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aattgacggc gatttagggc gtgatgaatt tgatgacggc gatttataca gtatttggcg 180

gagataaaaa atg gcg aag aaa aag aaa aaa tta caa caa gcg aaa aaa 229
Met Ala Lys Lys Lys Lys Lys Leu Gln Gln Ala Lys Lys
1 5 10

gta caa gtt ggc tta gat aca caa aca aat gag gcg cgt gtc acg gag 277
Val Gln Val Gly Leu Asp Thr Gln Thr Asn Glu Ala Arg Val Thr Glu
15 20 25

aca gga aga att att tct gat cac cca agc aat aaa att acc ccc gca 325
Thr Gly Arg Ile Ile Ser Asp His Pro Ser Asn Lys Ile Thr Pro Ala
30 35 40 45

aag tta aaa ggg att tta gaa gat gct gaa ggt ggt gat att acc gcg 373
Lys Leu Lys Gly Ile Leu Glu Asp Ala Glu Gly Gly Asp Ile Thr Ala
50 55 60

caa cat gag ctt ttc atg gat att gaa gaa cgc gac agt tgc atc ggg 421
Gln His Glu Leu Phe Met Asp Ile Glu Glu Arg Asp Ser Cys Ile Gly
65 70 75

gca aat att caa acc cgt aag cgt gcg att tta acc ctt gac tgg cgc 469
Ala Asn Ile Gln Thr Arg Lys Arg Ala Ile Leu Thr Leu Asp Trp Arg
80 85 90

att gca gag cca cgt aat gcc aca ccg caa gaa gaa aaa ctg caa gtc 517
Ile Ala Glu Pro Arg Asn Ala Thr Pro Gln Glu Glu Lys Leu Gln Val
95 100 105

gaa att gac gag ctt ttc tat caa ttc cca atg cta gaa gat tta atg 565
Glu Ile Asp Glu Leu Phe Tyr Gln Phe Pro Met Leu Glu Asp Leu Met
110 115 120 125

gtg gat atg atg gat gcg gta gga cat ggt ttt tcg gcg tta gaa att 613
Val Asp Met Met Asp Ala Val Gly His Gly Phe Ser Ala Leu Glu Ile
130 135 140

gaa tgg aag caa gct gaa agt aaa tgg att cca gtt aat ttt atc gca 661
Glu Trp Lys Gln Ala Glu Ser Lys Trp Ile Pro Val Asn Phe Ile Ala
145 150 155

cgt ccg cag tcg tgg ttt aaa cta gac aag gat gat aat tta ctg ctt 709
Arg Pro Gln Ser Trp Phe Lys Leu Asp Lys Asp Asp Asn Leu Leu Leu
160 165 170

aaa acg cca gat aat caa gac ggt gag ccg ttg aga caa tat ggc tgg 757
Lys Thr Pro Asp Asn Gln Asp Gly Glu Pro Leu Arg Gln Tyr Gly Trp
175 180 185

gta gtg cat acc cac aaa tca aga aca gta cag ctt gct cgt atg ggt 805

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Val Val His Thr His Lys Ser Arg Thr Val Gln Leu Ala Arg Met Gly
190                 195                 200                 205

tta ttt aga acg ctc gca tgg ctt tat atg ttt aaa cac tac tcg gtg   853
Leu Phe Arg Thr Leu Ala Trp Leu Tyr Met Phe Lys His Tyr Ser Val
                210                 215                 220

cat gat ttt gcc gaa ttt cta gag ctt tat ggt atg ccg att cgt att   901
His Asp Phe Ala Glu Phe Leu Glu Leu Tyr Gly Met Pro Ile Arg Ile
            225                 230                 235

ggt aaa tac cca ttt ggg gca acg aat gac gaa aag cgc aca tta ttg   949
Gly Lys Tyr Pro Phe Gly Ala Thr Asn Asp Glu Lys Arg Thr Leu Leu
        240                 245                 250

cgt gca ctt gct caa atc gga cat aac gca gca ggg att atg cca gaa   997
Arg Ala Leu Ala Gln Ile Gly His Asn Ala Ala Gly Ile Met Pro Glu
    255                 260                 265

gga atg aat gtt gag ttg cat aat gtg aca aac act act ggc tcg gct  1045
Gly Met Asn Val Glu Leu His Asn Val Thr Asn Thr Thr Gly Ser Ala
270                 275                 280                 285

gga agc aac ccg ttt ttg caa atg gtg gac tgg tgt gaa aag tcc gcc  1093
Gly Ser Asn Pro Phe Leu Gln Met Val Asp Trp Cys Glu Lys Ser Ala
                290                 295                 300

gca cgt ttg att cta ggg caa aca tta aca agc ggt gca gat ggt aaa  1141
Ala Arg Leu Ile Leu Gly Gln Thr Leu Thr Ser Gly Ala Asp Gly Lys
            305                 310                 315

act tca act aat gcc ctt gga caa gtg cat aat gaa gtc aga cgt gac  1189
Thr Ser Thr Asn Ala Leu Gly Gln Val His Asn Glu Val Arg Arg Asp
        320                 325                 330

ttg ctt gtg tct gat gct aaa cag att gca caa act att aca caa cag  1237
Leu Leu Val Ser Asp Ala Lys Gln Ile Ala Gln Thr Ile Thr Gln Gln
    335                 340                 345

att att ctg cca tat ctt caa att aac att gat ccg aat att ttg cct  1285
Ile Ile Leu Pro Tyr Leu Gln Ile Asn Ile Asp Pro Asn Ile Leu Pro
350                 355                 360                 365

tct cgt gtg ccg tat ttc gag ttt gac acg aaa gaa tat gct gat tta  1333
Ser Arg Val Pro Tyr Phe Glu Phe Asp Thr Lys Glu Tyr Ala Asp Leu
                370                 375                 380

agt gtc cta gcg gat gct att cct aag ctt gtg agc gta gga gtg cgc  1381
Ser Val Leu Ala Asp Ala Ile Pro Lys Leu Val Ser Val Gly Val Arg
            385                 390                 395

att cct gaa aat tgg gtg cgt gat aaa gcg ggc att cca gaa ccg cag  1429
Ile Pro Glu Asn Trp Val Arg Asp Lys Ala Gly Ile Pro Glu Pro Gln
        400                 405                 410

gaa aat gaa acg att tta agt gcg gtt caa cat gat ttt aaa aca gat  1477
Glu Asn Glu Thr Ile Leu Ser Ala Val Gln His Asp Phe Lys Thr Asp
    415                 420                 425

tta aac gat gtt gaa aat ccg aaa aaa cag acc gca ctt tct gta caa  1525
Leu Asn Asp Val Glu Asn Pro Lys Lys Gln Thr Ala Leu Ser Val Gln
430                 435                 440                 445
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aat cac gtg aca ggt tgt cag tgt gat ggc tgt cgt ggt gtt gca tta   1573
Asn His Val Thr Gly Cys Gln Cys Asp Gly Cys Arg Gly Val Ala Leu
                450                 455                 460

tct gcg aat aat aac agt tct act gcg cag ggc gtg cta gat ggt gga   1621
Ser Ala Asn Asn Asn Ser Ser Thr Ala Gln Gly Val Leu Asp Gly Gly
            465                 470                 475

ctt gcg caa gca ttt aat gag cct gat ttt aat aaa caa tta aat cca   1669
Leu Ala Gln Ala Phe Asn Glu Pro Asp Phe Asn Lys Gln Leu Asn Pro
        480                 485                 490

atg gta aag aaa gct gtt gcg gta ctc atg gca tgt gac tct tac gat   1717
Met Val Lys Lys Ala Val Ala Val Leu Met Ala Cys Asp Ser Tyr Asp
    495                 500                 505

gag gcg gca gaa aaa ctc gct gaa gca tac cca gaa att tca agt cac   1765
Glu Ala Ala Glu Lys Leu Ala Glu Ala Tyr Pro Glu Ile Ser Ser His
510                 515                 520                 525

gaa cac gaa cag tat ctc tca aat gcg ctg ttt tta gct gat tta ctt   1813
Glu His Glu Gln Tyr Leu Ser Asn Ala Leu Phe Leu Ala Asp Leu Leu
                530                 535                 540

gga gga act aat gtc taaaccgctt agttttctat tcggacttga accaacgcaa   1868
Gly Gly Thr Asn Val
            545

gccattgagt ttttacataa taaaaaatta cttgcaacga aagtgtttaa aaaatcactg 1928

catgatagtg ccatcgcaag agctacaaca atcgcgagat tatctagtct tgagatgacg 1988

aatgatattt ataaatcaat ggaagttgcc aaaaaagagg gtaagagctt tacacaatgg 2048

aaaaaagact tggtaagtga gtttgagaaa aaaggctggg tattcgggca tgataaatct 2108

atcagtcgcg gtatcgacgg aaaactgttg gctgatccga aaacaggcga atattttggt 2168

acaccgcgtc ggctgaatac aatttatcgt acaaacgtgc aagccgcata ttctgcggcg 2228

cgctatcagc gcatgatgga taatattgat catcgcccct attggcaata ttccgctgtc 2288

agcgatgagc gtacacgacc ctctcatctt gcactaaacg gtcgaattta tcgctatgat 2348

gacccgtttt ggtcga                                                 2364
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<210> 26
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<213> Pasteurella multocida

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Met Ala Lys Lys Lys Lys Lys Leu Gln Gln Ala Lys Lys Val Gln Val
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Gly Leu Asp Thr Gln Thr Asn Glu Ala Arg Val Thr Glu Thr Gly Arg
             20                  25                  30

Ile Ile Ser Asp His Pro Ser Asn Lys Ile Thr Pro Ala Lys Leu Lys
         35                  40                  45

Gly Ile Leu Glu Asp Ala Glu Gly Gly Asp Ile Thr Ala Gln His Glu
```

```
     50                  55                  60

Leu Phe Met Asp Ile Glu Glu Arg Asp Ser Cys Ile Gly Ala Asn Ile
 65                  70                  75                  80

Gln Thr Arg Lys Arg Ala Ile Leu Thr Leu Asp Trp Arg Ile Ala Glu
                 85                  90                  95

Pro Arg Asn Ala Thr Pro Gln Glu Glu Lys Leu Gln Val Glu Ile Asp
            100                 105                 110

Glu Leu Phe Tyr Gln Phe Pro Met Leu Glu Asp Leu Met Val Asp Met
        115                 120                 125

Met Asp Ala Val Gly His Gly Phe Ser Ala Leu Glu Ile Glu Trp Lys
    130                 135                 140

Gln Ala Glu Ser Lys Trp Ile Pro Val Asn Phe Ile Ala Arg Pro Gln
145                 150                 155                 160

Ser Trp Phe Lys Leu Asp Lys Asp Asp Asn Leu Leu Leu Lys Thr Pro
                165                 170                 175

Asp Asn Gln Asp Gly Glu Pro Leu Arg Gln Tyr Gly Trp Val Val His
            180                 185                 190

Thr His Lys Ser Arg Thr Val Gln Leu Ala Arg Met Gly Leu Phe Arg
        195                 200                 205

Thr Leu Ala Trp Leu Tyr Met Phe Lys His Tyr Ser Val His Asp Phe
    210                 215                 220

Ala Glu Phe Leu Glu Leu Tyr Gly Met Pro Ile Arg Ile Gly Lys Tyr
225                 230                 235                 240

Pro Phe Gly Ala Thr Asn Asp Glu Lys Arg Thr Leu Leu Arg Ala Leu
                245                 250                 255

Ala Gln Ile Gly His Asn Ala Ala Gly Ile Met Pro Glu Gly Met Asn
            260                 265                 270

Val Glu Leu His Asn Val Thr Asn Thr Thr Gly Ser Ala Gly Ser Asn
        275                 280                 285

Pro Phe Leu Gln Met Val Asp Trp Cys Glu Lys Ser Ala Ala Arg Leu
    290                 295                 300

Ile Leu Gly Gln Thr Leu Thr Ser Gly Ala Asp Gly Lys Thr Ser Thr
305                 310                 315                 320

Asn Ala Leu Gly Gln Val His Asn Glu Val Arg Arg Asp Leu Leu Val
                325                 330                 335

Ser Asp Ala Lys Gln Ile Ala Gln Thr Ile Thr Gln Gln Ile Ile Leu
            340                 345                 350

Pro Tyr Leu Gln Ile Asn Ile Asp Pro Asn Ile Leu Pro Ser Arg Val
        355                 360                 365

Pro Tyr Phe Glu Phe Asp Thr Lys Glu Tyr Ala Asp Leu Ser Val Leu
    370                 375                 380
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Ala Asp Ala Ile Pro Lys Leu Val Ser Val Gly Val Arg Ile Pro Glu
385                 390                 395                 400

Asn Trp Val Arg Asp Lys Ala Gly Ile Pro Glu Pro Gln Glu Asn Glu
                405                 410                 415

Thr Ile Leu Ser Ala Val Gln His Asp Phe Lys Thr Asp Leu Asn Asp
            420                 425                 430

Val Glu Asn Pro Lys Lys Gln Thr Ala Leu Ser Val Gln Asn His Val
        435                 440                 445

Thr Gly Cys Gln Cys Asp Gly Cys Arg Gly Val Ala Leu Ser Ala Asn
    450                 455                 460

Asn Asn Ser Ser Thr Ala Gln Gly Val Leu Asp Gly Gly Leu Ala Gln
465                 470                 475                 480

Ala Phe Asn Glu Pro Asp Phe Asn Lys Gln Leu Asn Pro Met Val Lys
                485                 490                 495

Lys Ala Val Ala Val Leu Met Ala Cys Asp Ser Tyr Asp Glu Ala Ala
            500                 505                 510

Glu Lys Leu Ala Glu Ala Tyr Pro Glu Ile Ser Ser His Glu His Glu
        515                 520                 525

Gln Tyr Leu Ser Asn Ala Leu Phe Leu Ala Asp Leu Leu Gly Gly Thr
    530                 535                 540

Asn Val
545
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<210> 27
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<212> DNA
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g tca acg aaa gtc ggt tac gat att aat aac act cat cgt ttt aca ctg 49
  Ser Thr Lys Val Gly Tyr Asp Ile Asn Asn Thr His Arg Phe Thr Leu
    1   5   10   15

ttt tta gaa gat cgc cgt gaa aag aag ctt acc gaa gaa aaa aca tta   97
Phe Leu Glu Asp Arg Arg Glu Lys Lys Leu Thr Glu Glu Lys Thr Leu
            20   25   30

ggg ctt agt gat gca gtg cgt ttt gct aat gat caa acc cct tat ctc   145
Gly Leu Ser Asp Ala Val Arg Phe Ala Asn Asp Gln Thr Pro Tyr Leu
        35   40   45

cgt tat ggt att gaa tat cga tat aac ggc ttg tct tgg ttg gaa acg   193
Arg Tyr Gly Ile Glu Tyr Arg Tyr Asn Gly Leu Ser Trp Leu Glu Thr
    50   55   60

gta aag ctt ttt ttg gca aag cag aaa atc gaa caa cgt tct gct ctc   241
Val Lys Leu Phe Leu Ala Lys Gln Lys Ile Glu Gln Arg Ser Ala Leu
65   70   75   80

caa gag ttt gat att aat aat agg aat aaa ttg gat tcg act atg tcg   289
Gln Glu Phe Asp Ile Asn Asn Arg Asn Lys Leu Asp Ser Thr Met Ser
                85   90   95

ttt gta tat tta caa aga cag aat ata gct cgg gga gaa ttt tca acg   337
Phe Val Tyr Leu Gln Arg Gln Asn Ile Ala Arg Gly Glu Phe Ser Thr
            100   105   110

agt cct tta tat tgg ggg ccg agt cgc cat cgt tta tnt gcg aaa ttc   385
Ser Pro Leu Tyr Trp Gly Pro Ser Arg His Arg Leu Xaa Ala Lys Phe
        115   120   125

gaa ttt cgt gat ang ttt tta gaa aat atg aat aag cnt ttt acg ttt   433
Glu Phe Arg Asp Xaa Phe Leu Glu Asn Met Asn Lys Xaa Phe Thr Phe
    130   135   140

cgg ccg tgg caa atc aat ana ttc aga caa caa ggt cga aat aac tat   481
Arg Pro Trp Gln Ile Asn Xaa Phe Arg Gln Gln Gly Arg Asn Asn Tyr
145   150   155   160

aca gaa gtg ttt ccc gtt aaa tcc cga gag ttt tct ttt tct ctt atg   529
Thr Glu Val Phe Pro Val Lys Ser Arg Glu Phe Ser Phe Ser Leu Met
                165   170   175

gac gac att aag att ggc gaa ttg cta cat ctc gga ttg ggc ggt cgg   577
Asp Asp Ile Lys Ile Gly Glu Leu Leu His Leu Gly Leu Gly Gly Arg
            180   185   190

tgg gat cac tat aac tat aag cca tta tta aat tct cag cat aat atc   625
Trp Asp His Tyr Asn Tyr Lys Pro Leu Leu Asn Ser Gln His Asn Ile
        195   200   205

aac agg aca cag aga tta cct tat cca aaa aca tca tcc aaa ttt tcg   673
Asn Arg Thr Gln Arg Leu Pro Tyr Pro Lys Thr Ser Ser Lys Phe Ser
    210   215   220

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tat caa ttg agt tta gag tat caa tta cat cca tca cat caa att gca   721
Tyr Gln Leu Ser Leu Glu Tyr Gln Leu His Pro Ser His Gln Ile Ala
225                 230                 235                 240

tac cgt tta agt acc ggt ttt agg gtt ccc cgt gtt gaa gat ctt tat   769
Tyr Arg Leu Ser Thr Gly Phe Arg Val Pro Arg Val Glu Asp Leu Tyr
                245                 250                 255

ttt gaa gac cga gga aaa agt tct tca caa ttt ctt cct aac ccc gat   817
Phe Glu Asp Arg Gly Lys Ser Ser Ser Gln Phe Leu Pro Asn Pro Asp
            260                 265                 270

cta caa ccg gaa act gca ctg aat cat gaa ata agt tac cgt ttc caa   865
Leu Gln Pro Glu Thr Ala Leu Asn His Glu Ile Ser Tyr Arg Phe Gln
        275                 280                 285

aat caa tat gcc cat ttc agc gtc ggg ctt ttc cgt aca cgt tat cat   913
Asn Gln Tyr Ala His Phe Ser Val Gly Leu Phe Arg Thr Arg Tyr His
    290                 295                 300

aac ttt att caa gaa cgt gag atg acc tgt gat aaa att cca tat gag   961
Asn Phe Ile Gln Glu Arg Glu Met Thr Cys Asp Lys Ile Pro Tyr Glu
305                 310                 315                 320

tat aat agg act tat gga tat tgc acg cat aat act tat gta atg ttt   1009
Tyr Asn Arg Thr Tyr Gly Tyr Cys Thr His Asn Thr Tyr Val Met Phe
                325                 330                 335

gtt aat gaa cct gaa gcc gtg att aaa ggg gtt gaa gta agc ggt gct   1057
Val Asn Glu Pro Glu Ala Val Ile Lys Gly Val Glu Val Ser Gly Ala
            340                 345                 350

tta aat ggg tcg gca ttc gga ctt tcc gac ggt tta act ttc cgt ctc   1105
Leu Asn Gly Ser Ala Phe Gly Leu Ser Asp Gly Leu Thr Phe Arg Leu
        355                 360                 365

aaa ggg agc tac agc aaa ggt caa aat cat gac ggc gat ccg tta aaa   1153
Lys Gly Ser Tyr Ser Lys Gly Gln Asn His Asp Gly Asp Pro Leu Lys
    370                 375                 380

tct att caa cca tgg aca gtg gta acc ggt att gat tac gaa act gaa   1201
Ser Ile Gln Pro Trp Thr Val Val Thr Gly Ile Asp Tyr Glu Thr Glu
385                 390                 395                 400

ggg tgg agc gtg agt ttg agc ggg cgt tat agt gcg gct aaa aaa gcc   1249
Gly Trp Ser Val Ser Leu Ser Gly Arg Tyr Ser Ala Ala Lys Lys Ala
                405                 410                 415

aaa gat gcg ata gaa acg gaa tac aca cat gat aaa aag gtt gtc aaa   1297
Lys Asp Ala Ile Glu Thr Glu Tyr Thr His Asp Lys Lys Val Val Lys
            420                 425                 430

caa tgg ccg cat tta agt cca tcc tac ttt gtt gtt gat ttt acg ggg   1345
Gln Trp Pro His Leu Ser Pro Ser Tyr Phe Val Val Asp Phe Thr Gly
        435                 440                 445


caa gtt ga                                                       1353
Gln Val
    450
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<213> Pasteurella multocida

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<223> Xaa = any or unknown amino acid

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Phe Leu Glu Asp Arg Arg Glu Lys Lys Leu Thr Glu Glu Lys Thr Leu
             20                  25                  30

Gly Leu Ser Asp Ala Val Arg Phe Ala Asn Asp Gln Thr Pro Tyr Leu
         35                  40                  45

Arg Tyr Gly Ile Glu Tyr Arg Tyr Asn Gly Leu Ser Trp Leu Glu Thr
     50                  55                  60

Val Lys Leu Phe Leu Ala Lys Gln Lys Ile Glu Gln Arg Ser Ala Leu
 65                  70                  75                  80

Gln Glu Phe Asp Ile Asn Asn Arg Asn Lys Leu Asp Ser Thr Met Ser
                 85                  90                  95

Phe Val Tyr Leu Gln Arg Gln Asn Ile Ala Arg Gly Glu Phe Ser Thr
            100                 105                 110

Ser Pro Leu Tyr Trp Gly Pro Ser Arg His Arg Leu Xaa Ala Lys Phe
        115                 120                 125

Glu Phe Arg Asp Xaa Phe Leu Glu Asn Met Asn Lys Xaa Phe Thr Phe
    130                 135                 140

Arg Pro Trp Gln Ile Asn Xaa Phe Arg Gln Gln Gly Arg Asn Asn Tyr
145                 150                 155                 160

Thr Glu Val Phe Pro Val Lys Ser Arg Glu Phe Ser Phe Ser Leu Met
                165                 170                 175

Asp Asp Ile Lys Ile Gly Glu Leu Leu His Leu Gly Leu Gly Gly Arg
            180                 185                 190

Trp Asp His Tyr Asn Tyr Lys Pro Leu Leu Asn Ser Gln His Asn Ile
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        195                 200                 205

Asn Arg Thr Gln Arg Leu Pro Tyr Pro Lys Thr Ser Ser Lys Phe Ser
    210                 215                 220

Tyr Gln Leu Ser Leu Glu Tyr Gln Leu His Pro Ser His Gln Ile Ala
225                 230                 235                 240

Tyr Arg Leu Ser Thr Gly Phe Arg Val Pro Arg Val Glu Asp Leu Tyr
                245                 250                 255

Phe Glu Asp Arg Gly Lys Ser Ser Ser Gln Phe Leu Pro Asn Pro Asp
            260                 265                 270

Leu Gln Pro Glu Thr Ala Leu Asn His Glu Ile Ser Tyr Arg Phe Gln
        275                 280                 285

Asn Gln Tyr Ala His Phe Ser Val Gly Leu Phe Arg Thr Arg Tyr His
    290                 295                 300

Asn Phe Ile Gln Glu Arg Glu Met Thr Cys Asp Lys Ile Pro Tyr Glu
305                 310                 315                 320

Tyr Asn Arg Thr Tyr Gly Tyr Cys Thr His Asn Thr Tyr Val Met Phe
                325                 330                 335

Val Asn Glu Pro Glu Ala Val Ile Lys Gly Val Glu Val Ser Gly Ala
            340                 345                 350

Leu Asn Gly Ser Ala Phe Gly Leu Ser Asp Gly Leu Thr Phe Arg Leu
        355                 360                 365

Lys Gly Ser Tyr Ser Lys Gly Gln Asn His Asp Gly Asp Pro Leu Lys
    370                 375                 380

Ser Ile Gln Pro Trp Thr Val Val Thr Gly Ile Asp Tyr Glu Thr Glu
385                 390                 395                 400

Gly Trp Ser Val Ser Leu Ser Gly Arg Tyr Ser Ala Ala Lys Lys Ala
                405                 410                 415

Lys Asp Ala Ile Glu Thr Glu Tyr Thr His Asp Lys Lys Val Val Lys
            420                 425                 430

Gln Trp Pro His Leu Ser Pro Ser Tyr Phe Val Val Asp Phe Thr Gly
        435                 440                 445

Gln Val
    450


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<212> DNA
<213> Pasteurella multocida

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<222> (1078)..(2769)

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catggctagc attctagcaa aaattagttg aggaaaatag cggtcttgtt ttgcttaaaa 180

aacaacccac cccgtagggc acggctgttt ctttttgaga aattacgctt cttcatcttg 240

atctttttc aagatctcat cttcattgag ttttaaaaga cgggcaatcg cattgcggta 300

ggagatttca aggctttctc gactagtagc aatgacacct tgatcgatta agaaaccgtc 360

attgacatca taaacccaac catgtaatga gagtttttc ccatttttcc acgcggattt 420

aatgattgac gagcgaccta agttataaac ttgctctgcg acgttaattt tcgtcagcat 480

atcagcccgt ttttcaggcg gtaaattgcc aagtaaatga ctatgcttat accaaatatc 540

gcgtaagtgg agtaaccagt tattaattaa acctaaatct tgatccgcca ttgcggcttt 600

aattccacca cagtttgtat gtccacaaat aataatgtgt tcaatattta agacctcaac 660

ggcatattgc acaacagata aacagtttaa atcggtgtga atgacttgat ttgcaacatt 720

acgatgcaca aacagctcac ccggtcctaa atttgttaat ttttctgcag gaacacggct 780

atccgagcaa ccaatccaaa gatagctcgg ggtttgatga tcagccaatt ctttaaagta 840

agaggagttt tcctctttca tccgtaacgc ccagctataa ttattggcaa aaagttgttc 900

aatttttttc attagagtga ttcctatacc gcaaaaataa gggggctagt atagcttaga 960

aatagacagt gggtaaagaa aggcaaaaaa ttgtatagga taacttgttt tttattgcca 1020

tttatttaga attagaatct ttaataataa aaataattat cattaaggtt aatagtt 1077

atg gat aaa aat tta atg aag gga tgt gta ttc tta tca ata gtc ggt 1125
Met Asp Lys Asn Leu Met Lys Gly Cys Val Phe Leu Ser Ile Val Gly
1 5 10 15

tgc ggt atc caa ata ggg cta gca tca aat cca aat cct cca gat gtg 1173
Cys Gly Ile Gln Ile Gly Leu Ala Ser Asn Pro Asn Pro Pro Asp Val
20 25 30

gat gag tta tta cct att att gtg aat gct gat gaa gat aat aaa tta 1221
Asp Glu Leu Leu Pro Ile Ile Val Asn Ala Asp Glu Asp Asn Lys Leu
35 40 45

cca ggt cgt tct gta tta aaa cag aaa aat atc gat caa caa caa gca 1269
Pro Gly Arg Ser Val Leu Lys Gln Lys Asn Ile Asp Gln Gln Gln Ala
50 55 60

gat aat gcc gct gac tta ata aat att tta cct ggg gta aat atg gcg 1317
Asp Asn Ala Ala Asp Leu Ile Asn Ile Leu Pro Gly Val Asn Met Ala
65 70 75 80

gga gga ttt cgc cct ggt ggt caa aca tta aat att aat gga atg ggt 1365
Gly Gly Phe Arg Pro Gly Gly Gln Thr Leu Asn Ile Asn Gly Met Gly
85 90 95

gat gct gaa gat gtt aga gtt caa cta gac ggc gca aca aaa agt ttc 1413
Asp Ala Glu Asp Val Arg Val Gln Leu Asp Gly Ala Thr Lys Ser Phe

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                100                 105                 110

gaa aaa tat caa caa ggc tct att ttt att gaa cct gag tta tta aga   1461
Glu Lys Tyr Gln Gln Gly Ser Ile Phe Ile Glu Pro Glu Leu Leu Arg
        115                 120                 125

aag gtg aca gta gac aaa gga aat tat tct cct caa tat ggc aat ggt   1509
Lys Val Thr Val Asp Lys Gly Asn Tyr Ser Pro Gln Tyr Gly Asn Gly
    130                 135                 140

ggc ttt gct ggt act gta aaa ttt gaa aca aaa gat gca act gat ttt   1557
Gly Phe Ala Gly Thr Val Lys Phe Glu Thr Lys Asp Ala Thr Asp Phe
145                 150                 155                 160

ttg aaa gaa aat cag aaa ata ggt gga tta ttt aaa tat gga aat aat   1605
Leu Lys Glu Asn Gln Lys Ile Gly Gly Leu Phe Lys Tyr Gly Asn Asn
                165                 170                 175

agc aat aat aac caa aaa act tat agt aca gcc cta gtt tta cag aat   1653
Ser Asn Asn Asn Gln Lys Thr Tyr Ser Thr Ala Leu Val Leu Gln Asn
            180                 185                 190

gaa caa aaa aat att gat ttg tta tta ttt ggt tct gta aga aat gca   1701
Glu Gln Lys Asn Ile Asp Leu Leu Leu Phe Gly Ser Val Arg Asn Ala
        195                 200                 205

agc aat tat aca aga cct gat aaa agt aaa att ctt ttt tca aaa aac   1749
Ser Asn Tyr Thr Arg Pro Asp Lys Ser Lys Ile Leu Phe Ser Lys Asn
    210                 215                 220

aat caa aaa agt gga tta ata aaa gta aat tgg caa att act cct gaa   1797
Asn Gln Lys Ser Gly Leu Ile Lys Val Asn Trp Gln Ile Thr Pro Glu
225                 230                 235                 240

cat tta tta act tta tcc agt gtt tat ggc att cat aaa ggg tgg gaa   1845
His Leu Leu Thr Leu Ser Ser Val Tyr Gly Ile His Lys Gly Trp Glu
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cct tgg gca gca aaa aga gat gtg atg tcg aga cca aca gaa aca gaa   1893
Pro Trp Ala Ala Lys Arg Asp Val Met Ser Arg Pro Thr Glu Thr Glu
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ata aaa cac tat ggg att gat gtt gcg tgg aaa cgt aaa ctt gtt tat   1941
Ile Lys His Tyr Gly Ile Asp Val Ala Trp Lys Arg Lys Leu Val Tyr
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Arg Asp Gln Lys Asp Glu Ser Tyr Ser Leu Lys Tyr Arg Tyr Leu Pro
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gaa aat aat aag tgg att aat ttg tct gtt cag ctg agt tat agt aaa   2037
Glu Asn Asn Lys Trp Ile Asn Leu Ser Val Gln Leu Ser Tyr Ser Lys
305                 310                 315                 320

aca gag cag aat gat act cgc cat gag aaa gtc act tct tca ttc cta   2085
Thr Glu Gln Asn Asp Thr Arg His Glu Lys Val Thr Ser Ser Phe Leu
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ggt aca tta gga aat aaa agt tgg ata act tat tca gat ctt act ttt   2133
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Asp Ile Ser Asn Thr Ser Thr Leu Asn Ile Gly Arg Ala Glu His Glu
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cta cta ttt ggt tta cag tgg tta aaa aat aaa aga aat acc ctt atg   2229
Leu Leu Phe Gly Leu Gln Trp Leu Lys Asn Lys Arg Asn Thr Leu Met
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tat cat aaa ggg gga gtc aag aag gca gac tat aat tat ggc tat ttt   2277
Tyr His Lys Gly Gly Val Lys Lys Ala Asp Tyr Asn Tyr Gly Tyr Phe
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Gln Pro Tyr Tyr Met Pro Ser Gly Arg Gln Tyr Thr Gln Ala Phe Tyr
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tta caa gat caa ata aaa tgg cag aat ttc ctc ttt aca gga ggg ata   2373
Leu Gln Asp Gln Ile Lys Trp Gln Asn Phe Leu Phe Thr Gly Gly Ile
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aga tat gac cat atc aat aat ata ggg cag aaa aat tta gcg cca cga   2421
Arg Tyr Asp His Ile Asn Asn Ile Gly Gln Lys Asn Leu Ala Pro Arg
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tat aat gat atc tct gca gga cat gat tat agc cag aaa aat tat aat   2469
Tyr Asn Asp Ile Ser Ala Gly His Asp Tyr Ser Gln Lys Asn Tyr Asn
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Gly Trp Ser Tyr Tyr Leu Gly Leu Lys Tyr Asp Val Asn His Tyr Leu
465                 470                 475                 480

agt tta ttt acg aat ttt agt aaa act tgg cga gcc cct gtt att gat   2565
Ser Leu Phe Thr Asn Phe Ser Lys Thr Trp Arg Ala Pro Val Ile Asp
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gaa cag tat gag aca caa tat agt caa gct tct gta tct gcg act tct   2613
Glu Gln Tyr Glu Thr Gln Tyr Ser Gln Ala Ser Val Ser Ala Thr Ser
            500                 505                 510

tta aat tta gaa aaa gaa atg att aat caa acc aga gtg ggt gga att   2661
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Pro Gly Arg Ser Val Leu Lys Gln Lys Asn Ile Asp Gln Gln Gln Ala
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Ser Asn Tyr Thr Arg Pro Asp Lys Ser Lys Ile Leu Phe Ser Lys Asn
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Asn Gln Lys Ser Gly Leu Ile Lys Val Asn Trp Gln Ile Thr Pro Glu
225 230 235 240

His Leu Leu Thr Leu Ser Ser Val Tyr Gly Ile His Lys Gly Trp Glu
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Pro Trp Ala Ala Lys Arg Asp Val Met Ser Arg Pro Thr Glu Thr Glu
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Ile Lys His Tyr Gly Ile Asp Val Ala Trp Lys Arg Lys Leu Val Tyr
275 280 285

Arg Asp Gln Lys Asp Glu Ser Tyr Ser Leu Lys Tyr Arg Tyr Leu Pro
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Gly Thr Leu Gly Asn Lys Ser Trp Ile Thr Tyr Ser Asp Leu Thr Phe
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Asp Ile Ser Asn Thr Ser Thr Leu Asn Ile Gly Arg Ala Glu His Glu
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Leu Leu Phe Gly Leu Gln Trp Leu Lys Asn Lys Arg Asn Thr Leu Met
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Tyr His Lys Gly Gly Val Lys Lys Ala Asp Tyr Asn Tyr Gly Tyr Phe
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Gln Pro Tyr Tyr Met Pro Ser Gly Arg Gln Tyr Thr Gln Ala Phe Tyr
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Tyr Asn Asp Ile Ser Ala Gly His Asp Tyr Ser Gln Lys Asn Tyr Asn
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Gly Trp Ser Tyr Tyr Leu Gly Leu Lys Tyr Asp Val Asn His Tyr Leu
465                 470                 475                 480

Ser Leu Phe Thr Asn Phe Ser Lys Thr Trp Arg Ala Pro Val Ile Asp
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Ile Thr Leu Asn His Leu Phe Gln Glu Asn Asp Ala Phe Gln Phe Arg
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Ile Thr Leu Ala Leu Leu Ser Tyr Cys Gly Thr Ile Leu Ala Asp Ser
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His Gln Glu Ala Thr Glu Leu Asp Thr Ile Thr Val Ser Ser Gln Gln
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Glu Leu Phe Glu Gly Tyr Gly Asn Phe Asn Asn Thr Arg Asn Ser Val
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Leu Ala Gly Arg Tyr Gln Met Phe Asp Ala Leu Ile Met His Ser Lys
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Arg His Gly His Glu Leu Glu Asn Tyr Asp Tyr Lys Asn Gly Arg Asp
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Ile Gln Gly Lys Glu Arg Glu Lys Ala Asp Pro Tyr Thr Ile Thr Lys
235                 240                 245                 250

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Phe Thr Val Ala Ser Asp Thr Tyr Leu Gln His Ser Arg Gly His Asp
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Leu Ser Tyr Asn Leu Val Ala Thr Thr His Ile Gln Leu Asp Glu Lys
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                335                 340                 345

tgt gat gga aat gag tta tgt gat tct tat aaa aat cca tta ggt ctc   5847
Cys Asp Gly Asn Glu Leu Cys Asp Ser Tyr Lys Asn Pro Leu Gly Leu
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                350                 355                 360

caa ttt aaa gat ggt cag att ctt gat cct gca ggg aat aaa att aaa   5895
Gln Phe Lys Asp Gly Gln Ile Leu Asp Pro Ala Gly Asn Lys Ile Lys
        365                 370                 375

cta cag ggg tct gga ttg agc act cag att gta gat gaa aat gga aaa   5943
Leu Gln Gly Ser Gly Leu Ser Thr Gln Ile Val Asp Glu Asn Gly Lys
    380                 385                 390

cca ttt cct aca aca aca ggt act aat aat gct gct ttt agt aat aat   5991
Pro Phe Pro Thr Thr Thr Gly Thr Asn Asn Ala Ala Phe Ser Asn Asn
395                 400                 405                 410

tta cga ctc agg cct aca ggt ttt tgg tta gat tgc tcg gtt ttt gac   6039
Leu Arg Leu Arg Pro Thr Gly Phe Trp Leu Asp Cys Ser Val Phe Asp
                415                 420                 425

tgt aat aaa cca ttc act gtt tat aat att agt aat gga aca tat caa   6087
Cys Asn Lys Pro Phe Thr Val Tyr Asn Ile Ser Asn Gly Thr Tyr Gln
            430                 435                 440

gca aga gag gtt cta ctg tct gaa gag ata act gtg gat ggt aaa tta   6135
Ala Arg Glu Val Leu Leu Ser Glu Glu Ile Thr Val Asp Gly Lys Leu
        445                 450                 455

tac aaa aca gct aag gaa gaa gga ggg ctt cca aat tat ttg att tta   6183
Tyr Lys Thr Ala Lys Glu Glu Gly Gly Leu Pro Asn Tyr Leu Ile Leu
    460                 465                 470


cct aat tct aaa ggt tat ctt cct tat gat tat aaa gaa agg gat ctt   6231
Pro Asn Ser Lys Gly Tyr Leu Pro Tyr Asp Tyr Lys Glu Arg Asp Leu
475                 480                 485                 490

aat acg aat aca aaa caa att aat tta gat tta act aaa aca ttt tta   6279
Asn Thr Asn Thr Lys Gln Ile Asn Leu Asp Leu Thr Lys Thr Phe Leu
                495                 500                 505

act ttc aac atc gaa aat aat ctg tca tat ggt gga gtt tat tct cgg   6327
Thr Phe Asn Ile Glu Asn Asn Leu Ser Tyr Gly Gly Val Tyr Ser Arg
            510                 515                 520

ata gag aaa gaa atg att aat aaa gct ggt tat gag ggg aga aat cct   6375
Ile Glu Lys Glu Met Ile Asn Lys Ala Gly Tyr Glu Gly Arg Asn Pro
        525                 530                 535

act tgg tgg gct gat aga att tta ggg caa agt agt tac tgt ggt tat   6423
Thr Trp Trp Ala Asp Arg Ile Leu Gly Gln Ser Ser Tyr Cys Gly Tyr
    540                 545                 550

aat gca ttg aag tgt ccg aaa cat gag cca tta acg tca ttt tta att   6471
Asn Ala Leu Lys Cys Pro Lys His Glu Pro Leu Thr Ser Phe Leu Ile
555                 560                 565                 570

cca gtt gaa gca acg aca cag tca tta tat ttt gca aat att ctt aag   6519
Pro Val Glu Ala Thr Thr Gln Ser Leu Tyr Phe Ala Asn Ile Leu Lys
                575                 580                 585

gta cat aat atg att agc ata gat tta gga tat cgt tat gat cat att   6567
Val His Asn Met Ile Ser Ile Asp Leu Gly Tyr Arg Tyr Asp His Ile
            590                 595                 600
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aaa tat aac cct gaa tac act cca gga gta act cca aaa att cca gat   6615
Lys Tyr Asn Pro Glu Tyr Thr Pro Gly Val Thr Pro Lys Ile Pro Asp
        605                 610                 615

gat atg gta aaa ggt ttg ttt att cct atg cca aaa gag cca cag cta   6663
Asp Met Val Lys Gly Leu Phe Ile Pro Met Pro Lys Glu Pro Gln Leu
    620                 625                 630

aag gat ttt gat tat aac tat gct aaa ttt ggt gag gcc tat aaa aaa   6711
Lys Asp Phe Asp Tyr Asn Tyr Ala Lys Phe Gly Glu Ala Tyr Lys Lys
635                 640                 645                 650

tgg aaa gaa tat ctg cca aaa aat gcg gaa gaa aat att gct tac att   6759
Trp Lys Glu Tyr Leu Pro Lys Asn Ala Glu Glu Asn Ile Ala Tyr Ile
                655                 660                 665

gct caa gat aag aca ttt aaa aaa cat tct tat tct ctt ggt gca act   6807
Ala Gln Asp Lys Thr Phe Lys Lys His Ser Tyr Ser Leu Gly Ala Thr
            670                 675                 680

ttc gat cct ctg aat ttt tta cga gta caa gta aaa tat tca aaa ggg   6855
Phe Asp Pro Leu Asn Phe Leu Arg Val Gln Val Lys Tyr Ser Lys Gly
        685                 690                 695

ttt aga gcc ccg act tcg gat gaa ctt tat ttt acc ttt aag cat cca   6903
Phe Arg Ala Pro Thr Ser Asp Glu Leu Tyr Phe Thr Phe Lys His Pro
    700                 705                 710


gat ttt acg att tta ccg aac ccc gtg ttg aaa cca gag gaa gca aaa   6951
Asp Phe Thr Ile Leu Pro Asn Pro Val Leu Lys Pro Glu Glu Ala Lys
715                 720                 725                 730

aat caa gag att gca tta aca gtg cac gat aat tgg gga ttt gtt agc   6999
Asn Gln Glu Ile Ala Leu Thr Val His Asp Asn Trp Gly Phe Val Ser
                735                 740                 745

aca agt gtt ttc caa aca aag tat cgt cat ttt att gat tta gcg tat   7047
Thr Ser Val Phe Gln Thr Lys Tyr Arg His Phe Ile Asp Leu Ala Tyr
            750                 755                 760

tta ggt tca aga aat tta tcg aat tcc gtg gga ggg cag gca caa gca   7095
Leu Gly Ser Arg Asn Leu Ser Asn Ser Val Gly Gly Gln Ala Gln Ala
        765                 770                 775

aga gat ttc caa gtt tat caa aat gtc aat gtc gat aat gcc aaa gtt   7143
Arg Asp Phe Gln Val Tyr Gln Asn Val Asn Val Asp Asn Ala Lys Val
    780                 785                 790

aaa gga ctt gaa att aat gca cgt ttg aat ttg gga tat ttt tgg cat   7191
Lys Gly Leu Glu Ile Asn Ala Arg Leu Asn Leu Gly Tyr Phe Trp His
795                 800                 805                 810

gtg ttg gat gga ttt aat acg agc tat aaa ttc act tac caa cgt ggt   7239
Val Leu Asp Gly Phe Asn Thr Ser Tyr Lys Phe Thr Tyr Gln Arg Gly
                815                 820                 825

cgt ttg gat ggc gat cgt cca atg aat gcg att cag cct aaa gct tct   7287
Arg Leu Asp Gly Asp Arg Pro Met Asn Ala Ile Gln Pro Lys Ala Ser
            830                 835                 840

gtt ttt ggt ttg ggc tac gat cat aaa gaa aat aaa ttt ggc gct gat   7335
Val Phe Gly Leu Gly Tyr Asp His Lys Glu Asn Lys Phe Gly Ala Asp
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        845                 850                 855

tta tat att aca cgt gtg agt gag aaa aaa gcg aaa gac act tat aat   7383
Leu Tyr Ile Thr Arg Val Ser Glu Lys Lys Ala Lys Asp Thr Tyr Asn
    860                 865                 870

atg ttc tat aaa gaa cag gga tat aaa gat agt gct gtt cgt tgg aga   7431
Met Phe Tyr Lys Glu Gln Gly Tyr Lys Asp Ser Ala Val Arg Trp Arg
875                 880                 885                 890

agt gat gac tat acg cta gtt gat gcg gtt ggt tat att aaa ccg att   7479
Ser Asp Asp Tyr Thr Leu Val Asp Ala Val Gly Tyr Ile Lys Pro Ile
                895                 900                 905

aag aat tta acg tta cag ttt ggc gtt tat aat ttg aca gac cgt aaa   7527
Lys Asn Leu Thr Leu Gln Phe Gly Val Tyr Asn Leu Thr Asp Arg Lys
            910                 915                 920

tac ttg aca tgg gaa tct gct cgt tcg att aaa cca ttt ggt aca agt   7575
Tyr Leu Thr Trp Glu Ser Ala Arg Ser Ile Lys Pro Phe Gly Thr Ser
        925                 930                 935

aat tta att aat caa aaa aca ggc gca gga att aat cgt ttt tac tca   7623
Asn Leu Ile Asn Gln Lys Thr Gly Ala Gly Ile Asn Arg Phe Tyr Ser
    940                 945                 950

cca ggt cgt aac ttt aaa ctc agt gcc gaa atc acc ttc taatcctaag    7672
Pro Gly Arg Asn Phe Lys Leu Ser Ala Glu Ile Thr Phe
955                 960                 965

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acctttaatc gcatccagta aagcaatatc ttgtggtgtt gtcaccacga ccgcccccgt 8632
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20 25 30

Leu Asp Thr Ile Thr Val Ser Ser Gln Gln Asp Glu Met Asn Ile Lys
35 40 45

Glu Lys Lys Ile Gly Glu Thr Val Lys Thr Ala Ser Gln Leu Lys Arg
50 55 60

Gln Gln Val Gln Asp Ser Arg Asp Leu Val Arg Tyr Glu Thr Gly Val
65 70 75 80

Thr Val Val Glu Ala Gly Arg Phe Gly Ser Ser Gly Tyr Ala Ile Arg

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                85                  90                  95

Gly Val Asp Glu Asn Arg Val Ala Ile Thr Val Asp Gly Leu His Gln
            100                 105                 110

Ala Glu Thr Leu Ser Ser Gln Gly Phe Lys Glu Leu Phe Glu Gly Tyr
        115                 120                 125

Gly Asn Phe Asn Asn Thr Arg Asn Ser Val Glu Ile Glu Thr Leu Lys
    130                 135                 140

Val Ala Lys Ile Ala Lys Gly Ala Asp Ser Val Lys Val Gly Ser Gly
145                 150                 155                 160

Ser Leu Gly Gly Ala Val Leu Phe Glu Thr Lys Asp Ala Arg Asp Phe
                165                 170                 175

Leu Thr Glu Lys Asp Trp His Ile Gly Tyr Lys Ala Gly Tyr Ser Thr
            180                 185                 190

Ala Asp Asn Gln Gly Leu Asn Ala Val Thr Leu Ala Gly Arg Tyr Gln
        195                 200                 205


Met Phe Asp Ala Leu Ile Met His Ser Lys Arg His Gly His Glu Leu
    210                 215                 220

Glu Asn Tyr Asp Tyr Lys Asn Gly Arg Asp Ile Gln Gly Lys Glu Arg
225                 230                 235                 240

Glu Lys Ala Asp Pro Tyr Thr Ile Thr Lys Glu Ser Thr Leu Val Lys
                245                 250                 255

Phe Ser Phe Ser Pro Thr Glu Asn His Arg Phe Thr Val Ala Ser Asp
            260                 265                 270

Thr Tyr Leu Gln His Ser Arg Gly His Asp Leu Ser Tyr Asn Leu Val
        275                 280                 285

Ala Thr Thr His Ile Gln Leu Asp Glu Lys Glu Ser Arg His Ala Asn
    290                 295                 300

Asp Leu Thr Lys Arg Lys Asn Val Ser Phe Thr Tyr Glu Asn Tyr Thr
305                 310                 315                 320

Val Thr Pro Phe Trp Asp Thr Leu Lys Leu Ser Tyr Ser Gln Gln Arg
                325                 330                 335

Ile Thr Thr Arg Ala Arg Thr Glu Asp Tyr Cys Asp Gly Asn Glu Leu
            340                 345                 350

Cys Asp Ser Tyr Lys Asn Pro Leu Gly Leu Gln Phe Lys Asp Gly Gln
        355                 360                 365

Ile Leu Asp Pro Ala Gly Asn Lys Ile Lys Leu Gln Gly Ser Gly Leu
    370                 375                 380

Ser Thr Gln Ile Val Asp Glu Asn Gly Lys Pro Phe Pro Thr Thr Thr
385                 390                 395                 400

Gly Thr Asn Asn Ala Ala Phe Ser Asn Asn Leu Arg Leu Arg Pro Thr
                405                 410                 415
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Gly Phe Trp Leu Asp Cys Ser Val Phe Asp Cys Asn Lys Pro Phe Thr
            420                 425                 430

Val Tyr Asn Ile Ser Asn Gly Thr Tyr Gln Ala Arg Glu Val Leu Leu
        435                 440                 445

Ser Glu Glu Ile Thr Val Asp Gly Lys Leu Tyr Lys Thr Ala Lys Glu
    450                 455                 460

Glu Gly Gly Leu Pro Asn Tyr Leu Ile Leu Pro Asn Ser Lys Gly Tyr
465                 470                 475                 480

Leu Pro Tyr Asp Tyr Lys Glu Arg Asp Leu Asn Thr Asn Thr Lys Gln
                485                 490                 495

Ile Asn Leu Asp Leu Thr Lys Thr Phe Leu Thr Phe Asn Ile Glu Asn
            500                 505                 510

Asn Leu Ser Tyr Gly Gly Val Tyr Ser Arg Ile Glu Lys Glu Met Ile
        515                 520                 525


Asn Lys Ala Gly Tyr Glu Gly Arg Asn Pro Thr Trp Trp Ala Asp Arg
    530                 535                 540

Ile Leu Gly Gln Ser Ser Tyr Cys Gly Tyr Asn Ala Leu Lys Cys Pro
545                 550                 555                 560

Lys His Glu Pro Leu Thr Ser Phe Leu Ile Pro Val Glu Ala Thr Thr
                565                 570                 575

Gln Ser Leu Tyr Phe Ala Asn Ile Leu Lys Val His Asn Met Ile Ser
            580                 585                 590

Ile Asp Leu Gly Tyr Arg Tyr Asp His Ile Lys Tyr Asn Pro Glu Tyr
        595                 600                 605

Thr Pro Gly Val Thr Pro Lys Ile Pro Asp Asp Met Val Lys Gly Leu
    610                 615                 620

Phe Ile Pro Met Pro Lys Glu Pro Gln Leu Lys Asp Phe Asp Tyr Asn
625                 630                 635                 640

Tyr Ala Lys Phe Gly Glu Ala Tyr Lys Lys Trp Lys Glu Tyr Leu Pro
                645                 650                 655

Lys Asn Ala Glu Glu Asn Ile Ala Tyr Ile Ala Gln Asp Lys Thr Phe
            660                 665                 670

Lys Lys His Ser Tyr Ser Leu Gly Ala Thr Phe Asp Pro Leu Asn Phe
        675                 680                 685

Leu Arg Val Gln Val Lys Tyr Ser Lys Gly Phe Arg Ala Pro Thr Ser
    690                 695                 700

Asp Glu Leu Tyr Phe Thr Phe Lys His Pro Asp Phe Thr Ile Leu Pro
705                 710                 715                 720

Asn Pro Val Leu Lys Pro Glu Glu Ala Lys Asn Gln Glu Ile Ala Leu
                725                 730                 735

Thr Val His Asp Asn Trp Gly Phe Val Ser Thr Ser Val Phe Gln Thr
            740                 745                 750
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Lys Tyr Arg His Phe Ile Asp Leu Ala Tyr Leu Gly Ser Arg Asn Leu
        755                 760                 765

Ser Asn Ser Val Gly Gly Gln Ala Gln Ala Arg Asp Phe Gln Val Tyr
    770                 775                 780

Gln Asn Val Asn Val Asp Asn Ala Lys Val Lys Gly Leu Glu Ile Asn
785                 790                 795                 800

Ala Arg Leu Asn Leu Gly Tyr Phe Trp His Val Leu Asp Gly Phe Asn
                805                 810                 815

Thr Ser Tyr Lys Phe Thr Tyr Gln Arg Gly Arg Leu Asp Gly Asp Arg
            820                 825                 830

Pro Met Asn Ala Ile Gln Pro Lys Ala Ser Val Phe Gly Leu Gly Tyr
        835                 840                 845


Asp His Lys Glu Asn Lys Phe Gly Ala Asp Leu Tyr Ile Thr Arg Val
    850                 855                 860

Ser Glu Lys Lys Ala Lys Asp Thr Tyr Asn Met Phe Tyr Lys Glu Gln
865                 870                 875                 880

Gly Tyr Lys Asp Ser Ala Val Arg Trp Arg Ser Asp Asp Tyr Thr Leu
                885                 890                 895

Val Asp Ala Val Gly Tyr Ile Lys Pro Ile Lys Asn Leu Thr Leu Gln
            900                 905                 910

Phe Gly Val Tyr Asn Leu Thr Asp Arg Lys Tyr Leu Thr Trp Glu Ser
        915                 920                 925

Ala Arg Ser Ile Lys Pro Phe Gly Thr Ser Asn Leu Ile Asn Gln Lys
    930                 935                 940

Thr Gly Ala Gly Ile Asn Arg Phe Tyr Ser Pro Gly Arg Asn Phe Lys
945                 950                 955                 960

Leu Ser Ala Glu Ile Thr Phe
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tgccccttct ttcggtgctt ttgaggagcg cacatgggct aaaaagcgtg tgtcggataa 360

aatccgctcg accaacactt ccaccttacc gccactggct ttacgtccaa acatccttgc 420

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ccgttaaata accaagaggt ggaag atg aca gaa gaa aat aaa gga aag aga   1132
                          Met Thr Glu Glu Asn Lys Gly Lys Arg
                            1               5

tat ttt tta tgg ttc ata ttg ttt atc ctt tca atc tat tta ttt att   1180
Tyr Phe Leu Trp Phe Ile Leu Phe Ile Leu Ser Ile Tyr Leu Phe Ile
 10                  15                  20                  25

acc ata caa gaa aga cga ggt tat tgt ttt gac aaa cgt gca tat att   1228
Thr Ile Gln Glu Arg Arg Gly Tyr Cys Phe Asp Lys Arg Ala Tyr Ile
                 30                  35                  40

cat gag ctt tat act gag caa gag tta att gat cgg ggg att gaa tat   1276
His Glu Leu Tyr Thr Glu Gln Glu Leu Ile Asp Arg Gly Ile Glu Tyr
             45                  50                  55

gtg gta tcc acc atg ccg tca ggt gtt att aaa cca gat ggc aca ata   1324
Val Val Ser Thr Met Pro Ser Gly Val Ile Lys Pro Asp Gly Thr Ile
         60                  65                  70

aaa gaa gta aag cgt tac acg agt gtc gag gag ttt aaa cag atg aac   1372
Lys Glu Val Lys Arg Tyr Thr Ser Val Glu Glu Phe Lys Gln Met Asn
     75                  80                  85

cca gct tgt tgt aca tta acc acc ttt att gat gaa gga ggc gat ggc   1420
Pro Ala Cys Cys Thr Leu Thr Thr Phe Ile Asp Glu Gly Gly Asp Gly
 90                  95                  100                 105

tat cca gat gat gat gga tat ggt tat gtc aga att gaa tat tta aga   1468
Tyr Pro Asp Asp Asp Gly Tyr Gly Tyr Val Arg Ile Glu Tyr Leu Arg
                110                 115                 120

cat tat gtt gag aat cta aaa cct tat cat aga gtg att tat ctt gaa   1516
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His Tyr Val Glu Asn Leu Lys Pro Tyr His Arg Val Ile Tyr Leu Glu
            125                 130                 135

tat acg ccc tgt gga gag tta agg gaa gag gcg gct ttt tca aaa aat   1564
Tyr Thr Pro Cys Gly Glu Leu Arg Glu Glu Ala Ala Phe Ser Lys Asn
        140                 145                 150

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tctaaaaatc aattcactct gaaagggatg gaatgcgtag attccctatt tcaagcatgc 1684

agtaatatgg atcatgggta ctgaggtgga agatggcaga agaaaataaa ggaaagagat 1744

atttttatg gttcatattg tttatccttt caatctattt atttattacc atacaagaaa 1804

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tgatcgatag aggggttgaa tatgtggtat ccaccatgcc gtcaggtgtt tttgaaccag 1924

atggcacaac aaccgaaata aaacgttatg ctagtgttga ggagtttaaa cagatgaacc 1984

ctgattgttg taaattaaca agatttatta atgaaggaat agatggctat ccagatgatg 2044

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             20                  25                  30

Tyr Cys Phe Asp Lys Arg Ala Tyr Ile His Glu Leu Tyr Thr Glu Gln
         35                  40                  45

Glu Leu Ile Asp Arg Gly Ile Glu Tyr Val Val Ser Thr Met Pro Ser
     50                  55                  60

Gly Val Ile Lys Pro Asp Gly Thr Ile Lys Glu Val Lys Arg Tyr Thr
 65                  70                  75                  80


Ser Val Glu Glu Phe Lys Gln Met Asn Pro Ala Cys Cys Thr Leu Thr
                 85                  90                  95

Thr Phe Ile Asp Glu Gly Gly Asp Gly Tyr Pro Asp Asp Asp Gly Tyr
            100                 105                 110

Gly Tyr Val Arg Ile Glu Tyr Leu Arg His Tyr Val Glu Asn Leu Lys
        115                 120                 125

Pro Tyr His Arg Val Ile Tyr Leu Glu Tyr Thr Pro Cys Gly Glu Leu
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Arg Glu Glu Ala Ala Phe Ser Lys Asn
145                 150


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gcagaactgg ctagcttatc acttttagat aattgtatta ttaaaagaag ctgtatgatt 180

gttattctat cattagtgga taataaatat tctttatttt ttgagagata aaaacaattc 240

atatttcaat agaaaacaga aaataaagat tatcaaaaga attatccgtc cttataaata 300

tgagtctgta ttgtgagatg atat atg aat att tta ttt gtt tct gat gat 351
Met Asn Ile Leu Phe Val Ser Asp Asp
1 5

gtt tat gct aaa cat ctg gtg gtt gcg att aaa agc att ata aat cat 399
Val Tyr Ala Lys His Leu Val Val Ala Ile Lys Ser Ile Ile Asn His
10 15 20 25

aat gaa aaa ggt att tca ttt tat att ttt gat ttg ggt ata aag gat 447
Asn Glu Lys Gly Ile Ser Phe Tyr Ile Phe Asp Leu Gly Ile Lys Asp
30 35 40

gaa aat aag aga aat att aat gat att gtt tct tct tat gga agt gaa 495
Glu Asn Lys Arg Asn Ile Asn Asp Ile Val Ser Ser Tyr Gly Ser Glu
45 50 55

gtc aac ttt att gct gtg aat gag aaa gaa ttt gag agt ttt cct gtt 543
Val Asn Phe Ile Ala Val Asn Glu Lys Glu Phe Glu Ser Phe Pro Val
60 65 70

caa att agt tat att tct tta gca aca tat gca agg cta aaa gcg gca 591
Gln Ile Ser Tyr Ile Ser Leu Ala Thr Tyr Ala Arg Leu Lys Ala Ala
75 80 85

gag tat ttg ccg gat aat tta aat aaa att att tat tta gat gtt gat 639
Glu Tyr Leu Pro Asp Asn Leu Asn Lys Ile Ile Tyr Leu Asp Val Asp
90 95 100 105

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gtt ttg gtt ttt aac tca tta gaa atg tta tgg aat gtt gat gtt aat   687
Val Leu Val Phe Asn Ser Leu Glu Met Leu Trp Asn Val Asp Val Asn
                110                 115                 120

aat ttt ctt acc gca gcc tgt tat gat tct ttc atc gaa aat gaa aag   735
Asn Phe Leu Thr Ala Ala Cys Tyr Asp Ser Phe Ile Glu Asn Glu Lys
            125                 130                 135

tct gag cat aaa aaa tcg att tca atg tca gat aag gaa tat tat ttt   783
Ser Glu His Lys Lys Ser Ile Ser Met Ser Asp Lys Glu Tyr Tyr Phe
        140                 145                 150

aat gca gga gta atg cta ttt aat tta gat gaa tgg cgg aag atg gat   831
Asn Ala Gly Val Met Leu Phe Asn Leu Asp Glu Trp Arg Lys Met Asp
    155                 160                 165

gta ttc tca aga gct tta gac ctg tta gct atg tat cct aat caa atg   879
Val Phe Ser Arg Ala Leu Asp Leu Leu Ala Met Tyr Pro Asn Gln Met
170                 175                 180                 185

att tat cag gat caa gat ata ttg aat atc ctt ttt agg aat aaa gtc   927
Ile Tyr Gln Asp Gln Asp Ile Leu Asn Ile Leu Phe Arg Asn Lys Val
                190                 195                 200

tgt tat tta gat tgc aga ttt aat ttc atg cca aat caa ctt gaa aga   975
Cys Tyr Leu Asp Cys Arg Phe Asn Phe Met Pro Asn Gln Leu Glu Arg
            205                 210                 215

ata aan caa tac cat aaa gga aaa ntg agc aac tta cat tct tta gaa   1023
Ile Xaa Gln Tyr His Lys Gly Lys Xaa Ser Asn Leu His Ser Leu Glu
        220                 225                 230

aaa aca acg atg cct gtc gtt att tca cat tat tgt ggt cca gaa aaa   1071
Lys Thr Thr Met Pro Val Val Ile Ser His Tyr Cys Gly Pro Glu Lys
    235                 240                 245

gcg tgg cat gcg gat tgt aaa cat ttt aat gta tat ttc tat cag aaa   1119
Ala Trp His Ala Asp Cys Lys His Phe Asn Val Tyr Phe Tyr Gln Lys
250                 255                 260                 265

ata tta gca naa atn tcg aga ggc ncg gat aaa gaa cgc gta tta tct   1167
Ile Leu Ala Xaa Xaa Ser Arg Gly Xaa Asp Lys Glu Arg Val Leu Ser
                270                 275                 280

ata aaa act tat ctc aag gcc ttg att aga agg att aga tat aaa ttc   1215
Ile Lys Thr Tyr Leu Lys Ala Leu Ile Arg Arg Ile Arg Tyr Lys Phe
            285                 290                 295

aaa tat caa gtc tat taactattga atttttgcaa atgagataag agtatagtgc   1270
Lys Tyr Gln Val Tyr
        300

tgatttcttc aaagcgaaaa ggaggaaata gcttgttcta atttattaca ataatggttg 1330

tattcatctt gattttgaag gaaagagagt gtttttttgta taaaagcatt ttcgtcacct 1390

aaatttacta atcctccaaa ttctcctcct cgnagaattt ctttcggacc ggtagggcag 1450

tccatggata ttacaggtgt accgcaagcc atgctttcta ggataactgt cggtaacccc 1510

tctttcaaag aggtgtgtaa aaatagctta gcatttttta ttaatggata cggattatct 1570

ttatttccta aaagaaaaca atcttcttgt agattgagtg attctatttg tttctctaat 1630
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Val Ala Ile Lys Ser Ile Ile Asn His Asn Glu Lys Gly Ile Ser Phe
20 25 30

Tyr Ile Phe Asp Leu Gly Ile Lys Asp Glu Asn Lys Arg Asn Ile Asn
35 40 45

Asp Ile Val Ser Ser Tyr Gly Ser Glu Val Asn Phe Ile Ala Val Asn
50 55 60

Glu Lys Glu Phe Glu Ser Phe Pro Val Gln Ile Ser Tyr Ile Ser Leu
65 70 75 80

Ala Thr Tyr Ala Arg Leu Lys Ala Ala Glu Tyr Leu Pro Asp Asn Leu
85 90 95

Asn Lys Ile Ile Tyr Leu Asp Val Asp Val Leu Val Phe Asn Ser Leu
100 105 110

Glu Met Leu Trp Asn Val Asp Val Asn Asn Phe Leu Thr Ala Ala Cys
115 120 125

Tyr Asp Ser Phe Ile Glu Asn Glu Lys Ser Glu His Lys Lys Ser Ile
130 135 140

Ser Met Ser Asp Lys Glu Tyr Tyr Phe Asn Ala Gly Val Met Leu Phe

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145                 150                 155                 160

Asn Leu Asp Glu Trp Arg Lys Met Asp Val Phe Ser Arg Ala Leu Asp
                165                 170                 175

Leu Leu Ala Met Tyr Pro Asn Gln Met Ile Tyr Gln Asp Gln Asp Ile
            180                 185                 190

Leu Asn Ile Leu Phe Arg Asn Lys Val Cys Tyr Leu Asp Cys Arg Phe
        195                 200                 205

Asn Phe Met Pro Asn Gln Leu Glu Arg Ile Xaa Gln Tyr His Lys Gly
    210                 215                 220

Lys Xaa Ser Asn Leu His Ser Leu Glu Lys Thr Thr Met Pro Val Val
225                 230                 235                 240

Ile Ser His Tyr Cys Gly Pro Glu Lys Ala Trp His Ala Asp Cys Lys
                245                 250                 255

His Phe Asn Val Tyr Phe Tyr Gln Lys Ile Leu Ala Xaa Xaa Ser Arg
            260                 265                 270

Gly Xaa Asp Lys Glu Arg Val Leu Ser Ile Lys Thr Tyr Leu Lys Ala
        275                 280                 285

Leu Ile Arg Arg Ile Arg Tyr Lys Phe Lys Tyr Gln Val Tyr
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gga cac cca gat gca gaa gct cgt aca aaa ttc gtc att aaa gaa tta   97
Gly His Pro Asp Ala Glu Ala Arg Thr Lys Phe Val Ile Lys Glu Leu
            20                  25                  30

nat aat aaa ggc att caa gat gag caa tta ttc atc gac acg ggg atg   145
Xaa Asn Lys Gly Ile Gln Asp Glu Gln Leu Phe Ile Asp Thr Gly Met
         35                  40                  45

tgg gat gcc gct tta gcg aaa gat aaa atg gat gca tgg tta tct agc   193
Trp Asp Ala Ala Leu Ala Lys Asp Lys Met Asp Ala Trp Leu Ser Ser
     50                  55                  60

tct aaa gca aat caa att gaa gtg atc atc gct aac aac gat ggt atg   241
Ser Lys Ala Asn Gln Ile Glu Val Ile Ile Ala Asn Asn Asp Gly Met
 65                  70                  75                  80

gcg atg ggg gca ttg gaa gcc acg aaa gca cat ggt aaa aaa tta cca   289
Ala Met Gly Ala Leu Glu Ala Thr Lys Ala His Gly Lys Lys Leu Pro
                85                  90                  95

atc ttc ngt gta nat gcg tta cca gaa gtc ctc caa tta atc aaa aaa   337
Ile Phe Xaa Val Xaa Ala Leu Pro Glu Val Leu Gln Leu Ile Lys Lys
            100                 105                 110

ggt gaa att gca ggt acg gtg tta aat gac ggt gtg aac caa ggt aaa   385
Gly Glu Ile Ala Gly Thr Val Leu Asn Asp Gly Val Asn Gln Gly Lys
        115                 120                 125

gcc gtt gtt caa tta agt aat aat ctt gca aaa gga aaa cct gcc act   433
Ala Val Val Gln Leu Ser Asn Asn Leu Ala Lys Gly Lys Pro Ala Thr
    130                 135                 140

gaa ggc aca aaa tgg cag tta aaa cga tcg tgt cct acg tat ccc tta   481
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Glu Gly Thr Lys Trp Gln Leu Lys Arg Ser Cys Pro Thr Tyr Pro Leu
145                 150                 155                 160

tgt tgg tgt gga tgc gga taacttaaac gagttcctaa aataataaac          529
Cys Trp Cys Gly Cys Gly
                165

tataacaaaa caagamgttg taattctcgg ggaggtatac cctccccctt tttatgtgag 589

gttggatatg acaactcaaa ttccaaatca agacagtgaa atactgctca caatgaccaa 649

cgtctgtaaa tcctttcccg gtgttaaagc gttagacaat gcaaacctaa ctgtgcgctc 709

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cttatttggt atttacagta aagatgaagg tgacatcctt ttcttaggca agccagtcaa 829

ctttaaaacg tcgaaagaag ccttagagaa cgggattttc atggtgcacc aagaacttaa 889

cttggttaaa caatgtactg taatggataa tcctttggnt aggacgttat ccattaaaag 949

caggctttgt cgatcacggc aaaatgtatc gtgataccaa agcagatttt tgaagaanta 1009

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cgtggctgtg gcattattta tatttcgcac aaaatggacg aaatcttcaa aatttgtgac 1249

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accaataccc caaaagaaac catcttaacg gtggaaaatc tgaccgcact taatcagcca 1429

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gtatcgacat tggtgcgaaa tatgaaattt atcagctgat tatggagtta gccaaaaaag 1969

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20 25 30

Xaa Asn Lys Gly Ile Gln Asp Glu Gln Leu Phe Ile Asp Thr Gly Met
35 40 45

Trp Asp Ala Ala Leu Ala Lys Asp Lys Met Asp Ala Trp Leu Ser Ser
50 55 60

Ser Lys Ala Asn Gln Ile Glu Val Ile Ile Ala Asn Asn Asp Gly Met
65 70 75 80

Ala Met Gly Ala Leu Glu Ala Thr Lys Ala His Gly Lys Lys Leu Pro
85 90 95

Ile Phe Xaa Val Xaa Ala Leu Pro Glu Val Leu Gln Leu Ile Lys Lys
100 105 110

Gly Glu Ile Ala Gly Thr Val Leu Asn Asp Gly Val Asn Gln Gly Lys
115 120 125

Ala Val Val Gln Leu Ser Asn Asn Leu Ala Lys Gly Lys Pro Ala Thr
130 135 140

Glu Gly Thr Lys Trp Gln Leu Lys Arg Ser Cys Pro Thr Tyr Pro Leu
145 150 155 160

Cys Trp Cys Gly Cys Gly
165

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tcaattggaa attgatgaat taaaagaaaa aaataaccaa tctcaacaag caaatgacgc 180

attacgcagt gaaaatgaac aactaaagag tgagcaccaa aactggcaag aacgtttacg 240

ctcattatta ggcaaaattg ataacgtata attcacttct tattaaggct tagtttttct 300

aagccttatt ttttaggaga aatta atg aaa aca aaa att tgt att atc act 352
Met Lys Thr Lys Ile Cys Ile Ile Thr
1 5

ggc agt acg ctt ggt ggt gca gaa tat gtt gca gaa cat att gct gaa 400
Gly Ser Thr Leu Gly Gly Ala Glu Tyr Val Ala Glu His Ile Ala Glu
10 15 20 25

ata tta gaa caa caa gat tat cct gta cgt tta gaa cat gga cca aat 448
Ile Leu Glu Gln Gln Asp Tyr Pro Val Arg Leu Glu His Gly Pro Asn
30 35 40

ttt gaa gaa gtg atc gat gaa aaa tgt tgg ctt gtt gtc acc tct acc 496
Phe Glu Glu Val Ile Asp Glu Lys Cys Trp Leu Val Val Thr Ser Thr
45 50 55

cat ggt gca ggt gaa tta ccg gat aat att aaa cct ctg ttt gaa aaa 544
His Gly Ala Gly Glu Leu Pro Asp Asn Ile Lys Pro Leu Phe Glu Lys
60 65 70

tta gca ttt cac cca aaa cag tta gct gac tta cgc ttt gcg gtg atc 592
Leu Ala Phe His Pro Lys Gln Leu Ala Asp Leu Arg Phe Ala Val Ile
75 80 85

ggg tta ggt aat tcg gat tat gat acc ttc tgt cac gca gtg gat cat 640
Gly Leu Gly Asn Ser Asp Tyr Asp Thr Phe Cys His Ala Val Asp His
90 95 100 105

gtg gaa caa tta ctg cta agc aaa gat gct tta caa ctg tgt gaa tcg 688
Val Glu Gln Leu Leu Leu Ser Lys Asp Ala Leu Gln Leu Cys Glu Ser
110 115 120

cta aga atg gat atg cta acc att act gat cct gaa cac acg gcc gaa 736
Leu Arg Met Asp Met Leu Thr Ile Thr Asp Pro Glu His Thr Ala Glu
125 130 135

caa tgg ctc cca caa ttt ctc agt caa tta taatatttat tccctataca 786
Gln Trp Leu Pro Gln Phe Leu Ser Gln Leu
140 145

atggcatatg taaatcaaat atgccatttt tcatctcgat caagcataat atttaaccaa 846

tcaaatcaat attttctctg tggataacta agatcaaaac tgtataaaag ctgtttttat 906

tccctgaata agattgaatg ttttttattc tgtggataac taaagaagtt attcacagtt 966

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aaaaaggatc aaaagatcca taaaatccga gataaattaa caaggttact atgttttata 1266

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taatgcgttt ttctgagcgt aattctcatc aaatctacct tgaacctgaa gggttgacaa 2166

acaaaacaaa gaaattgcgg atttacaaaa acaagtgcaa gcactgcaag cagatttaag 2226

cgaaatggca aagaaaaacc gcaatcaagc gttgattgca ggtggtattg gcggtggcat 2286

tgttgcagtc ggtattgagc tcattcgctt gcaatttggg ggctaactga tggcatttga 2346

tgaaaaaaca cgtgcgctgg ttcgtcgcta ctatgtattt gagtttttat cgcttgagca 2406

atcagcaagt aaagctaaag tctcatttaa caccgcgcga cgctggaaga aagaggcggc 2466

aagcaagggc gatgactggg ataaagtgcg tgatgtacaa gtaatggcgg gcaatgagct 2526

gactgatatc acaaaaggat tgttatcggg ctttattatt caatatcgcg caaccatgga 2586

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Pro Val Arg Leu Glu His Gly Pro Asn Phe Glu Glu Val Ile Asp Glu
        35                  40                  45

Lys Cys Trp Leu Val Val Thr Ser Thr His Gly Ala Gly Glu Leu Pro
    50                  55                  60

Asp Asn Ile Lys Pro Leu Phe Glu Lys Leu Ala Phe His Pro Lys Gln
65                  70                  75                  80

Leu Ala Asp Leu Arg Phe Ala Val Ile Gly Leu Gly Asn Ser Asp Tyr
                85                  90                  95

Asp Thr Phe Cys His Ala Val Asp His Val Glu Gln Leu Leu Leu Ser
            100                 105                 110

Lys Asp Ala Leu Gln Leu Cys Glu Ser Leu Arg Met Asp Met Leu Thr
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Ser Gln Leu
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tagcggttaa ttgggcagat ttatcttttg gtactatcac agcacacacg cccgctgcat 180

ccgcagtacg caaacaagca cctaagttat gtggatcagt cacaccatct aacactaata 240

gcaacggatt ggactgattt tgtaaaagcg tatctaaatc tgcttcattc aattctttcg 300

ctggctgaac acgtgccatg atgccttggt gtacttcgcc ctctgctttt ttatcaaggg 360

tttggcgatt aacaaattgg atagtaatac ccaaccgatg aagttcattg agcaaaggtt 420

gtaaacgttt atcgtcgcgc cctttgagtg cataaacttc aattaaacgc tctggcgcgt 480

tgtttaaaaa ggcacttact gcatgaatgc cataaatatt ttcactcatc tactttctct 540

ttttagctga tttcttactg gctttttttcg tggttgttga tggtttaaca acgcttgttt 600

ttcttaccgc acttttactg gtgcttggtt tacgtttatg gcgttgtttt tcgagacttt 660

cagcgtagcg tgcatttttc ttgagcttgt ctttggctgt tttgccttct cgtaatggtt 720

tacgctcact cgacactaaa gaaaaatcca cttggcgttg ttcaaggcta actgcttcca 780

cacggatttt taccttatcg ccaatgcggt agatcatacc actattttca ccgattaaac 840

gttgtcgagc gagatcaaat tggtagtagt cgttatctaa ggtagaaatg tggactaagc 900

catcaataaa gaggtcatct aagcggacaa ataagccaaa acctgtcaca gatgaaatca 960

cacctgtaaa ttcttcgcct acatgatctt gcatatattc gcattttagc cagtctgcaa 1020

catcacgagt ggcatcatcg gcccgtcgtt ctgtcatgga gcagtggtcg cctaatacat 1080

ccatgtcatc aagtgtatag tgataccctc ccgtatcagt ggttctccgt ttcgagcctt 1140

ttagtttggc taacaagtat ttaatcccac gatgcaaagt caaatcagga taacggcgaa 1200

ttggcgaagt aaaatgcgca tattcttcga gtgcaagccc aaagtgccca atattgtcag 1260

gatgataaac ggcttgactt aacgaacgta atacatggtt tgcaataact catgatctgg 1320

acgttcgcga atttgctcca ataatttagc gtagtctgcg gtacttggtt tactgccacc 1380

ttcaaggctt aaaccacatt cactgaggaa ttggcggaag cccgtcactt tttcttcgct 1440

tggacccgca tgaatacgga aaagggctgg ctcttgatgt ttttccataa agtttgccgc 1500

cgcaatattg gcgaggatca tacattcttc aatgatttta tgcgcatcat tacgaataac 1560

aggctcaatc cgttcgattc gccccatttc attaaacaca aacttacttt caatggtttc 1620

aaagtcaatg gcgccacgtt gatgacgggc ttccactaag gcttggtaca ttacatggag 1680

ttcttttaaa tggggaacca gtgcttgata acgagtacaa agttcttcat cgtcctctaa 1740

aatacgagca actttggtat aggttaagcg agcatgagag ttcatgaccg cttcataaaa 1800

ttcatagcct gtgattttac cttttgctga aacattcagc tcacagacca tacataagcg 1860

atcgacttgt gggtttaatg aacaaagtcc attggagagg atttccggta gcataggaac 1920

aacgcgattt gggaaatata ccgagtttcc acgcgcatgt gcttcggtat caagggcagt 1980

acgtaaacga acatagtagc tgacatcggc aatggcaacc cacagtttcc aaccgcctcc 2040

acgtttttc tggcaaaaaa ccgcatcgtc aaaatcgcga gcatcttcac catcaatggt 2100

gactaacgga agatggcgta aatcaatacg tcctgatttg gcttcttccg gtacttcttc 2160

actcagttta gaaacttgtt tgaggaccgc gtctggaaaa acatggggaa tatcatgatt 2220

acggatagca atttccacct ccatcccttt tgccatattt tcaccgagaa tttcgctaat 2280

cattccaaca ggttggctaa atgttgcggt acgtggtttt aattcaacta caaccacttg 2340

tcccatacga gcgccttggc ggtgttcatt cggaattaaa atgtcgcgat taattcgact 2400

atcgtcaggt actacataac caataccatc ttctaagaaa aaacgaccaa caatctgttt 2460

tttacgctgt tgtaagacgc ggacaatccg cacttcttgg cgaccacgac ggtcaaaacc 2520

gctaggttgg gcgaggacat agtcaccgtg cattactcgc tgcatttggc tgttgggtat 2580

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aaaccaatcg ctgtctttac cttcgacttg taaaaaacca taaccatcac gatgacctaa 2640

tacggtccct tttaataaat ccagtttttc cggtaaagcg tagcgtttac gtttagtgaa 2700

aaccaattgt ccgtcatttt ccatcgctct taagcgacgg cgcatggctt cttgttgttc 2760

ttcattttga atagcaaatg tggtcagtaa ttcttctttt gagataggtg cattatgttg 2820

acgaattgta tcaagaataa attcgcgact tgggatcggg ttctcatatt ttgcgagttc 2880

ttcttgatag tttggatctt gcaaatgtgg attgtttttg atttttgcca taatgactcc 2940

ctttgagaat ggaaatacgc attcgtttaa tgacctcaag tttgacactc tgatttgttg 3000

aaagcaagta aaaaacctgt tcgtgactga aacaatctgt actcgcggga tttgtcgtgc 3060

atgaaagcgt aaagacaaag caaatttcga caatttacag aaaattctct gttataaagg 3120

tacatttttt gatacattta gcacaatttt tcaatactca aatcagagtg tccattattt 3180

aatttagttc agcggaattc tt atg tta ttt aaa aaa att cga ggc tta ttt  3232
                        Met Leu Phe Lys Lys Ile Arg Gly Leu Phe
                          1               5                  10

tca aat gat ctg tcc atc gat ctt ggc aca gcg aat acc tta att tat   3280
Ser Asn Asp Leu Ser Ile Asp Leu Gly Thr Ala Asn Thr Leu Ile Tyr
                 15                  20                  25

gtc aaa gga caa ggg att gtt tta gat gaa cct tct gtt gtg gcg att   3328
Val Lys Gly Gln Gly Ile Val Leu Asp Glu Pro Ser Val Val Ala Ile
             30                  35                  40

cgc caa gaa cgt tca ggt gca tta aaa agc att gct gcg gtt ggt cgt   3376
Arg Gln Glu Arg Ser Gly Ala Leu Lys Ser Ile Ala Ala Val Gly Arg
         45                  50                  55

gat gcc aaa tta atg tta ggc cgt aca ccg aaa agc att gca gcg att   3424
Asp Ala Lys Leu Met Leu Gly Arg Thr Pro Lys Ser Ile Ala Ala Ile
     60                  65                  70

cgt cct atg aaa gat ggg gtg atc gca gat ttc ttt gtg aca gaa aaa   3472
Arg Pro Met Lys Asp Gly Val Ile Ala Asp Phe Phe Val Thr Glu Lys
 75                  80                  85                  90

atg ttg caa tat ttt att aaa caa gtg cac agc agc aat ttt atg cgt   3520
Met Leu Gln Tyr Phe Ile Lys Gln Val His Ser Ser Asn Phe Met Arg
                 95                 100                 105

cca agt cca cgt gtc tta gtt tgt gta cct gcg gga gct acg caa gtc   3568
Pro Ser Pro Arg Val Leu Val Cys Val Pro Ala Gly Ala Thr Gln Val
             110                 115                 120


gaa cga cgt gca atc aaa gaa tct gcc att ggt gct ggg gca cgc gag   3616
Glu Arg Arg Ala Ile Lys Glu Ser Ala Ile Gly Ala Gly Ala Arg Glu
         125                 130                 135

gtg tac ttg att gag gaa ccg atg gcg gca gcg att ggt gct aaa tta   3664
Val Tyr Leu Ile Glu Glu Pro Met Ala Ala Ala Ile Gly Ala Lys Leu
     140                 145                 150

cct gtt tcg act gcc aca ggt tcg atg gtg atc gat atc ggt ggt ggt   3712
Pro Val Ser Thr Ala Thr Gly Ser Met Val Ile Asp Ile Gly Gly Gly
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155                 160                 165                 170

acg acg gaa gtt gcg gtg att tct tta aat ggc att gtg tat tcc tct   3760
Thr Thr Glu Val Ala Val Ile Ser Leu Asn Gly Ile Val Tyr Ser Ser
                175                 180                 185

tca gtc cgc att ggt ggt gat cgt ttt gat gag gcg att att tct tat   3808
Ser Val Arg Ile Gly Gly Asp Arg Phe Asp Glu Ala Ile Ile Ser Tyr
            190                 195                 200

gta cgc aag acg ttc ggt tca att att ggg gaa ccg aca gca gag cgt   3856
Val Arg Lys Thr Phe Gly Ser Ile Ile Gly Glu Pro Thr Ala Glu Arg
        205                 210                 215

atc aaa caa gag att ggt agt gcg ttt att caa gaa ggc gat gaa gtc   3904
Ile Lys Gln Glu Ile Gly Ser Ala Phe Ile Gln Glu Gly Asp Glu Val
    220                 225                 230

cgt gaa att gaa gtg cat ggt cat aac tta gca gaa ggt gcg ccg cgt   3952
Arg Glu Ile Glu Val His Gly His Asn Leu Ala Glu Gly Ala Pro Arg
235                 240                 245                 250

tct ttc aaa ctc acc tca cgt gat gtg tta gaa gct att caa gcc ccg   4000
Ser Phe Lys Leu Thr Ser Arg Asp Val Leu Glu Ala Ile Gln Ala Pro
                255                 260                 265

tta aat ggc att gtt gcg gca gtg cgc acg gcc ttg gaa gag tgt caa   4048
Leu Asn Gly Ile Val Ala Ala Val Arg Thr Ala Leu Glu Glu Cys Gln
            270                 275                 280

cca gaa cat gct gcg gat att ttt gaa cgt ggc atg gtc tta act ggt   4096
Pro Glu His Ala Ala Asp Ile Phe Glu Arg Gly Met Val Leu Thr Gly
        285                 290                 295

ggc ggt gcc ctt att cgt aat att gat gtt tta ctg tca aaa gaa acc   4144
Gly Gly Ala Leu Ile Arg Asn Ile Asp Val Leu Leu Ser Lys Glu Thr
    300                 305                 310

ggt gtg ccg gtt atc atc gcc gat gat cct tta acc tgt gtt gcc cgt   4192
Gly Val Pro Val Ile Ile Ala Asp Asp Pro Leu Thr Cys Val Ala Arg
315                 320                 325                 330

ggt ggt ggc gag gca tta gag atg atc gat atg cac ggt ggt gat att   4240
Gly Gly Gly Glu Ala Leu Glu Met Ile Asp Met His Gly Gly Asp Ile
                335                 340                 345

ttt agt gac gat atc taatatgatt taaaagtgcg gtgatattag accgcacttt   4295
Phe Ser Asp Asp Ile
            350

tacttctctt ttattgctga caaggctagc ctaattcgta tatgaaacct atttttggaa 4355

aagcacctcc tttaggtctt cgcttaattc tggcgatttt agcatccatt gcattgattg 4415

tttcggacgg tcaatccaat gcgatgatta aagcacgcag tattatggaa accgcagtag 4475

gcgggctgta ttatcttgcc aatacaccga gaacggtatt ggatggggtt tcagataatt 4535

tggttgatac caataaattg caaattgaaa accgagtttt gcgtgatcaa ctgcgtgaaa 4595

aaaatgcaga tttattgttg ttagatcaac tcaaagtaga aaatcaacgc ctgcgcttat 4655

tgcttaattc ccctctacgt acagatgagt ataaaaaaat tgctgaagtt ttaacggcag 4715
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aaactgatgt gtatcgtaag caagtcgtga ttaaccaagg acaacgtgac ggtgcttatg 4775

tcgggcagcc gattattgat gaaaagggta ttgttgggca acttatctcc gttggtgaaa 4835

atacgagtcg cgttcttcta ttgacagatg tgactcattc tattccagta caagtactac 4895

gtaatgatgt ccgtttgatt gctagtggaa caggacggaa tgatgaactg agtttagatc 4955

atgtgccgcg ttcggtcgat attgtcaaag gggatttatt agtcacttct ggattaggtg 5015

ggcgtttttt agaaggttat cctgttgcca ttgtggaatc cgtatcacgt gatgggcaaa 5075

attattttgc tactgtaaca gcaaagccat tagcttcgat tgaacgttta cgctatgttt 5135

tgcttttatg gccgacgaat gaagagatgc gcaaagtcca gtctatttca cctgca 5191

<210> 42
<211> 351
<212> PRT
<213> Pasteurella multocida

<400> 42
Met Leu Phe Lys Lys Ile Arg Gly Leu Phe Ser Asn Asp Leu Ser Ile
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Asp Leu Gly Thr Ala Asn Thr Leu Ile Tyr Val Lys Gly Gln Gly Ile
20 25 30

Val Leu Asp Glu Pro Ser Val Val Ala Ile Arg Gln Glu Arg Ser Gly
35 40 45

Ala Leu Lys Ser Ile Ala Ala Val Gly Arg Asp Ala Lys Leu Met Leu
50 55 60

Gly Arg Thr Pro Lys Ser Ile Ala Ala Ile Arg Pro Met Lys Asp Gly
65 70 75 80

Val Ile Ala Asp Phe Phe Val Thr Glu Lys Met Leu Gln Tyr Phe Ile
85 90 95

Lys Gln Val His Ser Ser Asn Phe Met Arg Pro Ser Pro Arg Val Leu
100 105 110

Val Cys Val Pro Ala Gly Ala Thr Gln Val Glu Arg Arg Ala Ile Lys
115 120 125

Glu Ser Ala Ile Gly Ala Gly Ala Arg Glu Val Tyr Leu Ile Glu Glu
130 135 140

Pro Met Ala Ala Ala Ile Gly Ala Lys Leu Pro Val Ser Thr Ala Thr
145 150 155 160

Gly Ser Met Val Ile Asp Ile Gly Gly Gly Thr Thr Glu Val Ala Val
165 170 175

Ile Ser Leu Asn Gly Ile Val Tyr Ser Ser Ser Val Arg Ile Gly Gly
180 185 190

Asp Arg Phe Asp Glu Ala Ile Ile Ser Tyr Val Arg Lys Thr Phe Gly
195 200 205

Ser Ile Ile Gly Glu Pro Thr Ala Glu Arg Ile Lys Gln Glu Ile Gly

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    210                 215                 220

Ser Ala Phe Ile Gln Glu Gly Asp Glu Val Arg Glu Ile Glu Val His
225                 230                 235                 240

Gly His Asn Leu Ala Glu Gly Ala Pro Arg Ser Phe Lys Leu Thr Ser
                245                 250                 255

Arg Asp Val Leu Glu Ala Ile Gln Ala Pro Leu Asn Gly Ile Val Ala
            260                 265                 270

Ala Val Arg Thr Ala Leu Glu Glu Cys Gln Pro Glu His Ala Ala Asp
        275                 280                 285

Ile Phe Glu Arg Gly Met Val Leu Thr Gly Gly Gly Ala Leu Ile Arg
    290                 295                 300

Asn Ile Asp Val Leu Leu Ser Lys Glu Thr Gly Val Pro Val Ile Ile
305                 310                 315                 320

Ala Asp Asp Pro Leu Thr Cys Val Ala Arg Gly Gly Gly Glu Ala Leu
                325                 330                 335

Glu Met Ile Asp Met His Gly Gly Asp Ile Phe Ser Asp Asp Ile
            340                 345                 350


<210> 43
<211> 2172
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (1)..(1464)

<220>
<223> pnp

<400> 43
acc cgc gtt ggg att ggg tgg cac ctg aac cca aat acc gcg tta att   48
Thr Arg Val Gly Ile Gly Trp His Leu Asn Pro Asn Thr Ala Leu Ile
  1               5                  10                  15

gaa aaa gtg aaa gcg att gca gaa gcg cgt tta ggc gaa gca tac cgt   96
Glu Lys Val Lys Ala Ile Ala Glu Ala Arg Leu Gly Glu Ala Tyr Arg
             20                  25                  30

atc act gaa aac aag cac gtt atg aac aaa att gat gcg att aaa gct  144
Ile Thr Glu Asn Lys His Val Met Asn Lys Ile Asp Ala Ile Lys Ala
         35                  40                  45

gat gtg att gca caa atc aca gct gaa gta gca gaa ggc gaa gac atc  192
Asp Val Ile Ala Gln Ile Thr Ala Glu Val Ala Glu Gly Glu Asp Ile
     50                  55                  60

agt gaa ggg aaa att gtc gat att ttc acc gca ctt gaa agc caa atc  240
Ser Glu Gly Lys Ile Val Asp Ile Phe Thr Ala Leu Glu Ser Gln Ile
 65                  70                  75                  80

gta cgt agc cgt atc att gct ggt gaa cca cgt att gat ggt cgt aca  288
Val Arg Ser Arg Ile Ile Ala Gly Glu Pro Arg Ile Asp Gly Arg Thr
                 85                  90                  95
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gtg gat act gtt cgt gca tta gat att tgt act ggt gtt tta cca cgt   336
Val Asp Thr Val Arg Ala Leu Asp Ile Cys Thr Gly Val Leu Pro Arg
            100                 105                 110

aca cac ggt tct gcg att ttc acc cgt ggt gaa aca cag gcg tta gct   384
Thr His Gly Ser Ala Ile Phe Thr Arg Gly Glu Thr Gln Ala Leu Ala
        115                 120                 125

gtc gcg aca tta ggt aca gaa cgt gat gca caa att att gat gaa tta   432
Val Ala Thr Leu Gly Thr Glu Arg Asp Ala Gln Ile Ile Asp Glu Leu
    130                 135                 140

aca ggt gag cgt tca gat cac ttc tta ttc cac tac aac ttc ccg cca   480
Thr Gly Glu Arg Ser Asp His Phe Leu Phe His Tyr Asn Phe Pro Pro
145                 150                 155                 160

tat tct gtg ggt gaa acc ggt atg att ggt tca cca aaa cgt cgt gaa   528
Tyr Ser Val Gly Glu Thr Gly Met Ile Gly Ser Pro Lys Arg Arg Glu
                165                 170                 175

att ggt cat ggt cgt tta gcg aaa cgc ggt gta gct gca gtg atg cca   576
Ile Gly His Gly Arg Leu Ala Lys Arg Gly Val Ala Ala Val Met Pro
            180                 185                 190

aca ctt gcc gag ttc ccg tat gtg gta cgt gtt gtc tct gaa atc aca   624
Thr Leu Ala Glu Phe Pro Tyr Val Val Arg Val Val Ser Glu Ile Thr
        195                 200                 205

gaa tca aat ggt tct tct tct atg gca tcg gtt tgt ggt gcg tct tta   672
Glu Ser Asn Gly Ser Ser Ser Met Ala Ser Val Cys Gly Ala Ser Leu
    210                 215                 220

gca tta atg gat gcg ggt gta cca att aaa gcg gcg gtt gca ggt att   720
Ala Leu Met Asp Ala Gly Val Pro Ile Lys Ala Ala Val Ala Gly Ile
225                 230                 235                 240

gca atg ggc tta gtc aaa gaa gac gaa aaa ttt gtg gtg ctt tca gac   768
Ala Met Gly Leu Val Lys Glu Asp Glu Lys Phe Val Val Leu Ser Asp
                245                 250                 255

atc tta ggt gat gaa gat cac tta ggt gac atg gac ttc aaa gtc gcg   816
Ile Leu Gly Asp Glu Asp His Leu Gly Asp Met Asp Phe Lys Val Ala
            260                 265                 270


ggt aca cgt acg ggt gtg acg gca tta caa atg gat atc aaa atc gaa   864
Gly Thr Arg Thr Gly Val Thr Ala Leu Gln Met Asp Ile Lys Ile Glu
        275                 280                 285

ggt atc aca gca gaa atc atg caa att gcg tta aac caa gcg aaa agc   912
Gly Ile Thr Ala Glu Ile Met Gln Ile Ala Leu Asn Gln Ala Lys Ser
    290                 295                 300

gca cgt tta cac att tta ggt gtg atg gag caa gcg atc cca gcg cca   960
Ala Arg Leu His Ile Leu Gly Val Met Glu Gln Ala Ile Pro Ala Pro
305                 310                 315                 320

cgt gcg gat att tct gat ttt gca ccg cgt att tac act atg aaa att  1008
Arg Ala Asp Ile Ser Asp Phe Ala Pro Arg Ile Tyr Thr Met Lys Ile
                325                 330                 335

gat ccg aag aaa atc aaa gat gtg atc ggt aaa ggt ggt gca acc att  1056
Asp Pro Lys Lys Ile Lys Asp Val Ile Gly Lys Gly Gly Ala Thr Ile
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            340                 345                 350

cgt gcc tta aca gaa gaa aca ggt acc tca att gat atc gat gat gat   1104
Arg Ala Leu Thr Glu Glu Thr Gly Thr Ser Ile Asp Ile Asp Asp Asp
        355                 360                 365

ggt acg gtg aag att gct gcg gtt gat ggc aat tca gca aaa gag gtg   1152
Gly Thr Val Lys Ile Ala Ala Val Asp Gly Asn Ser Ala Lys Glu Val
    370                 375                 380

atg gcg cgt att gaa gat att act gca gaa gtt gaa gcg ggt gca gtg   1200
Met Ala Arg Ile Glu Asp Ile Thr Ala Glu Val Glu Ala Gly Ala Val
385                 390                 395                 400

tat aaa ggt aaa gtt act cgt tta gct gat ttt ggt gcc ttc gtt tct   1248
Tyr Lys Gly Lys Val Thr Arg Leu Ala Asp Phe Gly Ala Phe Val Ser
                405                 410                 415

atc gta ggt aac aaa gaa ggc tta gtg cat att tct caa atc gcg gaa   1296
Ile Val Gly Asn Lys Glu Gly Leu Val His Ile Ser Gln Ile Ala Glu
            420                 425                 430

gag cgt gtt gag aaa gtg agt gat tat ctt gca gtg ggg caa gaa gtg   1344
Glu Arg Val Glu Lys Val Ser Asp Tyr Leu Ala Val Gly Gln Glu Val
        435                 440                 445

act gtt aaa gtg gtt gag att gat cgt caa ggt cgt att cgt tta acc   1392
Thr Val Lys Val Val Glu Ile Asp Arg Gln Gly Arg Ile Arg Leu Thr
    450                 455                 460

atg aaa gaa gtt gca cca aag caa gaa cac gtt gat tct gtt gtc gca   1440
Met Lys Glu Val Ala Pro Lys Gln Glu His Val Asp Ser Val Val Ala
465                 470                 475                 480

gac gtt gcc gca gaa gaa aac gca taagcaataa acaccaacgc ccttcgtgat  1494
Asp Val Ala Ala Glu Glu Asn Ala
                485

aaagggcgtt ggtgtgcatg ttgataagta caatttgtgc tttaaggcga agcgaaatga 1554

agcaatttca tccgtggtta aagtgcctgc taattttccc attttgggta tgttgtttaa 1614

cagcttgtgt taatcatgaa caagtttttc tttcaaaaga gaaattaatg ttagcagagc 1674

aacatccgaa tgatcatctt gagcatgagg tgatggttgc gcaaattagc gaattgttac 1734

ttgttaaagg gttaaaaaaa gaagaacgtg cgattttaca ttttgagcga ggcgtgctgt 1794

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atccaaagtt ggcagcagcg tttaattatt taggtttata tttattgtta gaggaagatt 1914

acagcgcatc tctagatatc tttaatgtgt tgtttgaact tgatcctcaa tatgagtatg 1974

cattcctaaa tagagggcta aatttttatt acgtcggacg ttatgaatta gctcagcggg 2034

attttcttca attttatcaa gccgataaat cagatccata ccgcacttta tggctttatt 2094

taaatgaatt aaagcataat cctcaggatg cttctaaaaa tcttgctcaa cgagcaatgg 2154

ggctttctga tgaatatt                                              2172
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<210> 44
<211> 488
<212> PRT
<213> Pasteurella multocida

<400> 44
Thr Arg Val Gly Ile Gly Trp His Leu Asn Pro Asn Thr Ala Leu Ile
1 5 10 15

Glu Lys Val Lys Ala Ile Ala Glu Ala Arg Leu Gly Glu Ala Tyr Arg
20 25 30

Ile Thr Glu Asn Lys His Val Met Asn Lys Ile Asp Ala Ile Lys Ala
35 40 45

Asp Val Ile Ala Gln Ile Thr Ala Glu Val Ala Glu Gly Glu Asp Ile
50 55 60

Ser Glu Gly Lys Ile Val Asp Ile Phe Thr Ala Leu Glu Ser Gln Ile
65 70 75 80

Val Arg Ser Arg Ile Ile Ala Gly Glu Pro Arg Ile Asp Gly Arg Thr
85 90 95

Val Asp Thr Val Arg Ala Leu Asp Ile Cys Thr Gly Val Leu Pro Arg
100 105 110

Thr His Gly Ser Ala Ile Phe Thr Arg Gly Glu Thr Gln Ala Leu Ala
115 120 125

Val Ala Thr Leu Gly Thr Glu Arg Asp Ala Gln Ile Ile Asp Glu Leu
130 135 140

Thr Gly Glu Arg Ser Asp His Phe Leu Phe His Tyr Asn Phe Pro Pro
145 150 155 160

Tyr Ser Val Gly Glu Thr Gly Met Ile Gly Ser Pro Lys Arg Arg Glu
165 170 175

Ile Gly His Gly Arg Leu Ala Lys Arg Gly Val Ala Ala Val Met Pro
180 185 190

Thr Leu Ala Glu Phe Pro Tyr Val Val Arg Val Val Ser Glu Ile Thr
195 200 205

Glu Ser Asn Gly Ser Ser Ser Met Ala Ser Val Cys Gly Ala Ser Leu
210 215 220

Ala Leu Met Asp Ala Gly Val Pro Ile Lys Ala Ala Val Ala Gly Ile
225 230 235 240

Ala Met Gly Leu Val Lys Glu Asp Glu Lys Phe Val Val Leu Ser Asp
245 250 255

Ile Leu Gly Asp Glu Asp His Leu Gly Asp Met Asp Phe Lys Val Ala
260 265 270

Gly Thr Arg Thr Gly Val Thr Ala Leu Gln Met Asp Ile Lys Ile Glu
275 280 285

Gly Ile Thr Ala Glu Ile Met Gln Ile Ala Leu Asn Gln Ala Lys Ser
290 295 300

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Ala Arg Leu His Ile Leu Gly Val Met Glu Gln Ala Ile Pro Ala Pro
305                 310                 315                 320

Arg Ala Asp Ile Ser Asp Phe Ala Pro Arg Ile Tyr Thr Met Lys Ile
                325                 330                 335

Asp Pro Lys Lys Ile Lys Asp Val Ile Gly Lys Gly Gly Ala Thr Ile
            340                 345                 350

Arg Ala Leu Thr Glu Glu Thr Gly Thr Ser Ile Asp Ile Asp Asp Asp
        355                 360                 365

Gly Thr Val Lys Ile Ala Ala Val Asp Gly Asn Ser Ala Lys Glu Val
    370                 375                 380

Met Ala Arg Ile Glu Asp Ile Thr Ala Glu Val Glu Ala Gly Ala Val
385                 390                 395                 400

Tyr Lys Gly Lys Val Thr Arg Leu Ala Asp Phe Gly Ala Phe Val Ser
                405                 410                 415

Ile Val Gly Asn Lys Glu Gly Leu Val His Ile Ser Gln Ile Ala Glu
            420                 425                 430

Glu Arg Val Glu Lys Val Ser Asp Tyr Leu Ala Val Gly Gln Glu Val
        435                 440                 445

Thr Val Lys Val Val Glu Ile Asp Arg Gln Gly Arg Ile Arg Leu Thr
    450                 455                 460

Met Lys Glu Val Ala Pro Lys Gln Glu His Val Asp Ser Val Val Ala
465                 470                 475                 480

Asp Val Ala Ala Glu Glu Asn Ala
                485
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<210> 45
<211> 633
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (2)..(631)

<220>
<223> purF

<400> 45

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  Asp Gly Val Ser Val Tyr Ala Ala Arg Val His Met Gly Gln Arg Leu
    1               5                  10                  15

ggt gaa aaa att gca cgg gaa tgg gcg gat gtg gat gat att gat gtg   97
Gly Glu Lys Ile Ala Arg Glu Trp Ala Asp Val Asp Asp Ile Asp Val
            20                  25                  30

gtc att cct gtg cct gaa acc tct aac gat att gct tta cgt att gcg   145
Val Ile Pro Val Pro Glu Thr Ser Asn Asp Ile Ala Leu Arg Ile Ala
        35                  40                  45

cgc gtg tta aat aaa ccg tat cgt caa ggt ttt gtg aaa aat cgc tat   193
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Arg Val Leu Asn Lys Pro Tyr Arg Gln Gly Phe Val Lys Asn Arg Tyr
     50                  55                  60

gta gga cgt acg ttt att atg ccg ggg cag gca ttg cga gtc agt tct   241
Val Gly Arg Thr Phe Ile Met Pro Gly Gln Ala Leu Arg Val Ser Ser
 65                  70                  75                  80

gtt aga cgt aaa ctc aat acc att gct tca gaa ttt aaa gat aag aat   289
Val Arg Arg Lys Leu Asn Thr Ile Ala Ser Glu Phe Lys Asp Lys Asn
                 85                  90                  95

gtg tta tta gtt gac gac tcg att gta cgt ggt acc acg tct gaa caa   337
Val Leu Leu Val Asp Asp Ser Ile Val Arg Gly Thr Thr Ser Glu Gln
            100                 105                 110

att gtc gaa atg gcg aga gcg gca ggt gcg aag aaa att tat ttt gcc   385
Ile Val Glu Met Ala Arg Ala Ala Gly Ala Lys Lys Ile Tyr Phe Ala
        115                 120                 125

tct gct gca cca gaa att cgt tat cca aat gtg tat ggt att gat atg   433
Ser Ala Ala Pro Glu Ile Arg Tyr Pro Asn Val Tyr Gly Ile Asp Met
    130                 135                 140

cca acc aaa aat gaa ttg atc gct tat ggt cgt gat gta gat gaa att   481
Pro Thr Lys Asn Glu Leu Ile Ala Tyr Gly Arg Asp Val Asp Glu Ile
145                 150                 155                 160

gct aac tta att ggt gtg gat aaa ttg att ttc caa gat ttg gat gcg   529
Ala Asn Leu Ile Gly Val Asp Lys Leu Ile Phe Gln Asp Leu Asp Ala
                165                 170                 175

tta act ggt tct gtg caa caa gaa aat cca agt att caa gac ttt gat   577
Leu Thr Gly Ser Val Gln Gln Glu Asn Pro Ser Ile Gln Asp Phe Asp
            180                 185                 190

tgt tcg gtg ttt aca ggg gtt tat gtg acg ggc gat att aca cct gaa   625
Cys Ser Val Phe Thr Gly Val Tyr Val Thr Gly Asp Ile Thr Pro Glu
        195                 200                 205

tat ctg ga                                                       633
Tyr Leu
    210
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<210> 46
<211> 210
<212> PRT
<213> Pasteurella multocida

<400> 46

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Asp Gly Val Ser Val Tyr Ala Ala Arg Val His Met Gly Gln Arg Leu
  1               5                  10                  15

Gly Glu Lys Ile Ala Arg Glu Trp Ala Asp Val Asp Asp Ile Asp Val
             20                  25                  30

Val Ile Pro Val Pro Glu Thr Ser Asn Asp Ile Ala Leu Arg Ile Ala
         35                  40                  45

Arg Val Leu Asn Lys Pro Tyr Arg Gln Gly Phe Val Lys Asn Arg Tyr
     50                  55                  60

Val Gly Arg Thr Phe Ile Met Pro Gly Gln Ala Leu Arg Val Ser Ser
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```
 65                  70                  75                  80

Val Arg Arg Lys Leu Asn Thr Ile Ala Ser Glu Phe Lys Asp Lys Asn
                 85                  90                  95

Val Leu Leu Val Asp Asp Ser Ile Val Arg Gly Thr Thr Ser Glu Gln
            100                 105                 110

Ile Val Glu Met Ala Arg Ala Ala Gly Ala Lys Lys Ile Tyr Phe Ala
        115                 120                 125

Ser Ala Ala Pro Glu Ile Arg Tyr Pro Asn Val Tyr Gly Ile Asp Met
    130                 135                 140

Pro Thr Lys Asn Glu Leu Ile Ala Tyr Gly Arg Asp Val Asp Glu Ile
145                 150                 155                 160

Ala Asn Leu Ile Gly Val Asp Lys Leu Ile Phe Gln Asp Leu Asp Ala
                165                 170                 175

Leu Thr Gly Ser Val Gln Gln Glu Asn Pro Ser Ile Gln Asp Phe Asp
            180                 185                 190

Cys Ser Val Phe Thr Gly Val Tyr Val Thr Gly Asp Ile Thr Pro Glu
        195                 200                 205

Tyr Leu
    210


<210> 47
<211> 4788
<212> DNA
<213> Pasteurella multocida

<220>
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<220>
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<400> 47
gac gag gag aga aaa tta gct gat ttg gca aaa ggt atc gct cca gat   48
Asp Glu Glu Arg Lys Leu Ala Asp Leu Ala Lys Gly Ile Ala Pro Asp
  1               5                  10                  15

att att ttt aga gat gta ata gaa cgc tat caa aat gaa gtg tct ata   96
Ile Ile Phe Arg Asp Val Ile Glu Arg Tyr Gln Asn Glu Val Ser Ile
            20                  25                  30

act aaa aaa ggc gcg cga aat gaa att ata aga tta aac cgc ttt tta   144
Thr Lys Lys Gly Ala Arg Asn Glu Ile Ile Arg Leu Asn Arg Phe Leu
         35                  40                  45

aga tat gat att tct aat ctg tat att cgt gat tta aga aaa gaa gat   192
Arg Tyr Asp Ile Ser Asn Leu Tyr Ile Arg Asp Leu Arg Lys Glu Asp
```

```
     50                  55                  60

ttt gag gag tgg atc aga att cgc cta acc gaa gta tcg gat gct agc   240
Phe Glu Glu Trp Ile Arg Ile Arg Leu Thr Glu Val Ser Asp Ala Ser
 65                  70                  75                  80

gtt aga cgt gag ctt gtt act ata tcg tca gtg ctg aca aca gca ata   288
Val Arg Arg Glu Leu Val Thr Ile Ser Ser Val Leu Thr Thr Ala Ile
                 85                  90                  95

aat aag tgg gga tat att tca agg cat cca atg act ggt att gaa aaa   336
Asn Lys Trp Gly Tyr Ile Ser Arg His Pro Met Thr Gly Ile Glu Lys
            100                 105                 110

cca aaa aac tcg gca gaa aga aaa gaa cga tat tca gaa cag gac att   384
Pro Lys Asn Ser Ala Glu Arg Lys Glu Arg Tyr Ser Glu Gln Asp Ile
        115                 120                 125

aaa aca ata tta gaa aca gct aga tat tgt gaa gat aaa cta ccc ata   432
Lys Thr Ile Leu Glu Thr Ala Arg Tyr Cys Glu Asp Lys Leu Pro Ile
    130                 135                 140

aca ctc aaa caa aga gta gca att gca atg tta ttt gct att gaa acc   480
Thr Leu Lys Gln Arg Val Ala Ile Ala Met Leu Phe Ala Ile Glu Thr
145                 150                 155                 160

gct atg cgt gct ggt gag att gct agt ata aaa tgg gat aat gtt ttt   528
Ala Met Arg Ala Gly Glu Ile Ala Ser Ile Lys Trp Asp Asn Val Phe
                165                 170                 175

ctt gaa aag aga ata gta cat tta ccg aca act aaa aac ggg cac tct   576
Leu Glu Lys Arg Ile Val His Leu Pro Thr Thr Lys Asn Gly His Ser
            180                 185                 190


aga gat gtg ccg ctt tcg caa aga gct gtt gcg cta att tta aaa atg   624
Arg Asp Val Pro Leu Ser Gln Arg Ala Val Ala Leu Ile Leu Lys Met
        195                 200                 205

aaa gag gta gaa aat gga gat ctt gtg ttt cag acc acg cct gaa tca   672
Lys Glu Val Glu Asn Gly Asp Leu Val Phe Gln Thr Thr Pro Glu Ser
    210                 215                 220

tta agc acc acg ttt aga gtg tta aag aaa gag tgt gga ctt gaa cat   720
Leu Ser Thr Thr Phe Arg Val Leu Lys Lys Glu Cys Gly Leu Glu His
225                 230                 235                 240

ctc cat ttt cat gat acg aga agg gaa gcg ttg acg aga tta tct aag   768
Leu His Phe His Asp Thr Arg Arg Glu Ala Leu Thr Arg Leu Ser Lys
                245                 250                 255

aaa gta gat gta atg act cta gcc aaa att agc gga cat aga gat tta   816
Lys Val Asp Val Met Thr Leu Ala Lys Ile Ser Gly His Arg Asp Leu
            260                 265                 270

aga att tta caa aac aca tat tac gca ccg aat atg agt gaa gtg gca   864
Arg Ile Leu Gln Asn Thr Tyr Tyr Ala Pro Asn Met Ser Glu Val Ala
        275                 280                 285

aac ttg ttg gat taattcactc ttcttaaata cgccttttgc cacttgatta       916
Asn Leu Leu Asp
    290
```

catcgccagc cttatatctt ttactttcat tacttccttt ttctaatgaa actggggatg 976

gaaagtcttg gcgggtaata atatgacgag atgtgtaatt gtaagaacga ttaatcatga 1036

tagaaatgtc ttcaatacta agaagaactg gactatcttc tttaagttga gctaaggctc 1096

caaacctcac agagcgtagc acttcatctt gttgtttctt tgttagagaa atattttcca 1156

tttttacctc acttaaataa aaaagccgtc atggacggct taataaagca tttcgctata 1216

cagttctttt gaggtgtacc caatatcgaa cttgatttga ttgttttgtt ttgcgatttc 1276

cagtgcttct tttcgatcaa caaatcttcc gaagttggta ataacaccct gtttcttacc 1336

aattagcgga tattgtgtac cgttctcaat agatttaatt tgtttacgca taaacatgtc 1396

atagtgtctc gcgccagtca ctaaatgaag ttcttttgtt gtgtaatctt caagctcgca 1456

cgcagcgcag acgattaatt ctggacgatc tcccattttc ctatctccga gcatttttca 1516

tagcctcaaa ccaagcttgt gcgtctcctt cactgtaaaa taatgaaccg ctttctagca 1576

tttttctgtg cttatctcta ttagcatcaa aatagaatct aataattgtt gagttacctc 1636

ttttaaagac ctcttgattg tggtgtgctg ttttgattgg agcgggcaaa gtaagcgtta 1696

ctgttgggcg tggttcttcc cacattccga ctatatcaaa tggattttct aaatgcggat 1756

atttgttatg ttcaaaaaaa gaagatccat caatcgtcca agaatttctc tcaaattgtg 1816

tcttgctctt gccaatttga aatacacctt gatataagaa agtgttgaac ggaaagaact 1876

ttgaataatc agcagttaca tatcctttac ttccatttct aagcacaact ggctcaccgg 1936

ttaatgcttt ttctaagtca aatgctttca ttttttactc tccagcttgc tcatcaataa 1996

gctcatcaat ccattctcga atttcagatt ggaaattttc taacgaatta ttttcattaa 2056

aataatctgc ttcttttaac ttactcaccg ctgttttact aaagcattta taaaaaagac 2116

gcttttcttc aaacaaatca tcttttgaga ttgcgcatac ttttcctacg ccctctatac 2176

ttttgtcttg aataaaacta ttaaaaagaa cctcttcttg ctgcttgttt tctactaaaa 2236

tagaaatcgt atatttttt ggatattcca tttttaatcc tttcttttag ataacaaaaa 2296

accgcatttc tgcggttatt ctgtgtattt atttaaaata ttacttatag tttcagcatc 2356

ttctaatgtt aatttagaat agcttgaggt cattttttcct ttaacggcaa tcctcaattc 2416

ttccagcttt aagctataca agtagtcttt tttatcttta taaatacgac cgtacaccat 2476

tccggataat ttaccttctt catacccatt agataaattg atctttctat ctcgaccgcg 2536

cactctaatt gttaaatatt ttcttccaat ttttaagact tcagcctcat gttcaatgtt 2596

tgagcgcatg agtgtttcta aaaaatatac ggtatcgcca actttaagat ttttaatcca 2656

atctttattc ataaataccc ttatactttc ggtggcagtg gaagtggttg ccaatgagtt 2716

actgaagata gatggtaagt acgaagagac ataaagaaaa catcatctcg ccacgcgatt 2776

tttatttccc ctctatctgt ataaatcaga atatcctctc tctcactggg caatctatct 2836

tttacactaa tccagccatc atcttgcgaa aattccacaa tttctggctt ttcaagcacc 2896

aaatcagagc cgtaatcttc tttttcctct tcgctcaact gcttttcctt gcagtcagcc 2956

ttgccaagga cgacaccgta cacggcataa ggtaaatcat tcaacgcaaa atcctcatga 3016

tcacacatat catctgcgaa ctcatgagct tctactgcac catctaaaca actttgctta 3076

gcttgatnta atgtttcgtg taagttaacg atatgtatgt cattagatac atctactgag 3136

aaaaattttt tttctgtttc tatcatagtt aaattcctta ttcttttatt aatgggcgag 3196

gaatcggttg ccagtgtgta acgttaatag ctagatcata aattggacca ttctgattta 3256

tagctaccca aaaatattca ccatcagcaa tttctcttga tgcaattgcg taatgctcgc 3316

catattcacc ttcacaaaaa gcaatgactg gtgtttcaac ttctggtaac ttgtcatcaa 3376

cactaatcca gttgctatat tcccaatgaa aattaagctt ctcatagcca ttgatgactt 3436

gatctaacgc aggtcttaat tgggtttctc caacaataat atgtgttgtt atcttaatct 3496

ctgggattcc atctattact tcacaccagt ttttttcaat aaagtccaat ctttttttat 3556

ctgctaaaag actttcatat tctgcttttg tgattgttac tgtttctgtc atagttaaat 3616

tcctcatgat aaattccatg tttatttacc ttttttctgg cacaaaaaaa cacgctattg 3676

cgtgctgtct tgattgatat aatcaattaa tctaagccca atccatttca taactggaac 3736

agccatactg tttccaattg ctttgtatcg tggagaatca gggcattcat ctattgattt 3796

gttgcgatat gggattttag tgtaatcgtc tggaaatccc tgtaatcttt cacactcacg 3856

cggcgttagt tttctaacaa ctgattctac tgataaagca acgcaaggaa cattattacc 3916

accagttccc attcttgctt ttaaggttgg tgaaatatca tcgtgaatac gacaagcttc 3976

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aaagcttgtc tcaataaagg cggcaatatc ttttgcctgc gttccgctct gttcaatatt 4216

ccctcgcacg cttttggact caatgagtat ttgtgcaaca cttcgttttc tagcacttgc 4276

cacaagaaac actcttttac gacgttgggc aactccgaag tattgagcat cgagaactcg 4336

ccagcagatt gttcggattg aatgcacata accagcgttc gtccatcttc tccctgtgtg 4396

ctgcaatggc tcacactctt gaaccagtcc agccagaagg tgtccgaatg cgttgtccga 4456

ggtggatagc acacccggaa cgttttccca cacgagaatg cacggtggtt tgttgtcatt 4516

gaatctaaca tagtcgatcg cttctaaaat tttaattaaa actaacgtga gatttcctcg 4576

ctcatcgtct aaactttgac gattgccagc aactgaaaaa gattgacaag gagtaccacc 4636

aactaaaacg tctggtgccg gaatttcacg atctaatatt ttctgttgca attcagtcat 4696

atcaccaaga ttgggaacgt tagggtaatg gtaagctaat actgcgcttg ggaattgctc 4756

aatttcagaa aaccagagtg gctctgcgaa tt 4788

<210> 48
<211> 292
<212> PRT
<213> Pasteurella multocida

<400> 48

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Asp Glu Glu Arg Lys Leu Ala Asp Leu Ala Lys Gly Ile Ala Pro Asp
  1               5                  10                  15

Ile Ile Phe Arg Asp Val Ile Glu Arg Tyr Gln Asn Glu Val Ser Ile
             20                  25                  30

Thr Lys Lys Gly Ala Arg Asn Glu Ile Ile Arg Leu Asn Arg Phe Leu
         35                  40                  45

Arg Tyr Asp Ile Ser Asn Leu Tyr Ile Arg Asp Leu Arg Lys Glu Asp
     50                  55                  60

Phe Glu Glu Trp Ile Arg Ile Arg Leu Thr Glu Val Ser Asp Ala Ser
 65                  70                  75                  80

Val Arg Arg Glu Leu Val Thr Ile Ser Ser Val Leu Thr Thr Ala Ile
                 85                  90                  95

Asn Lys Trp Gly Tyr Ile Ser Arg His Pro Met Thr Gly Ile Glu Lys
            100                 105                 110

Pro Lys Asn Ser Ala Glu Arg Lys Glu Arg Tyr Ser Glu Gln Asp Ile
        115                 120                 125

Lys Thr Ile Leu Glu Thr Ala Arg Tyr Cys Glu Asp Lys Leu Pro Ile
    130                 135                 140

Thr Leu Lys Gln Arg Val Ala Ile Ala Met Leu Phe Ala Ile Glu Thr
145                 150                 155                 160

Ala Met Arg Ala Gly Glu Ile Ala Ser Ile Lys Trp Asp Asn Val Phe
                165                 170                 175

Leu Glu Lys Arg Ile Val His Leu Pro Thr Thr Lys Asn Gly His Ser
            180                 185                 190

Arg Asp Val Pro Leu Ser Gln Arg Ala Val Ala Leu Ile Leu Lys Met
        195                 200                 205

Lys Glu Val Glu Asn Gly Asp Leu Val Phe Gln Thr Thr Pro Glu Ser
    210                 215                 220

Leu Ser Thr Thr Phe Arg Val Leu Lys Lys Glu Cys Gly Leu Glu His
225                 230                 235                 240

Leu His Phe His Asp Thr Arg Arg Glu Ala Leu Thr Arg Leu Ser Lys
                245                 250                 255

Lys Val Asp Val Met Thr Leu Ala Lys Ile Ser Gly His Arg Asp Leu
            260                 265                 270

Arg Ile Leu Gln Asn Thr Tyr Tyr Ala Pro Asn Met Ser Glu Val Ala
        275                 280                 285
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10a cont.

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Asn Leu Leu Asp
    290


<210> 49
<211> 1618
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (2)..(1195)

<220>
<223> sopE

<400> 49
g ggc gat cta tgt ctg aaa ata tct aca tgg tgt caa agt cac aga atc 49
  Gly Asp Leu Cys Leu Lys Ile Ser Thr Trp Cys Gln Ser His Arg Ile
    1               5                  10                  15

aat caa gca att cgc aca att caa agt cta tca acc gca gtc atc ggt   97
Asn Gln Ala Ile Arg Thr Ile Gln Ser Leu Ser Thr Ala Val Ile Gly
            20                  25                  30

att gtc tgt act gca aat gac gca gac aat gaa aca ttc cca ctc aat   145
Ile Val Cys Thr Ala Asn Asp Ala Asp Asn Glu Thr Phe Pro Leu Asn
        35                  40                  45

gaa ccc gtt ctc atc aca aac gtg gca gcg gca att ggc aag gct gga   193
Glu Pro Val Leu Ile Thr Asn Val Ala Ala Ala Ile Gly Lys Ala Gly
    50                  55                  60

aaa caa ggc acg ctt tca cgt gcg ctt gac ggg att tct gat gta gtc   241
Lys Gln Gly Thr Leu Ser Arg Ala Leu Asp Gly Ile Ser Asp Val Val
65                  70                  75                  80

aat tgc aaa gtg att gtt gtg cga gtg caa gaa agt gcg caa gaa gac   289
Asn Cys Lys Val Ile Val Val Arg Val Gln Glu Ser Ala Gln Glu Asp
                85                  90                  95

gaa gaa aca aaa gca agt gaa atg aac acg gca att att ggc aca atc   337
Glu Glu Thr Lys Ala Ser Glu Met Asn Thr Ala Ile Ile Gly Thr Ile
            100                 105                 110

aca gaa gaa ggg cag tac aca ggc ttg aag gcg tta ttg att gcg aaa   385
Thr Glu Glu Gly Gln Tyr Thr Gly Leu Lys Ala Leu Leu Ile Ala Lys
        115                 120                 125

aac aaa ttc ggt atc aaa cca cgt att tta tgt gtg cca aaa ttc gac   433
Asn Lys Phe Gly Ile Lys Pro Arg Ile Leu Cys Val Pro Lys Phe Asp
    130                 135                 140

aca aaa gaa gtc gcc aca gag ctt gca agt atc gcc gcc aaa ctc aac   481
Thr Lys Glu Val Ala Thr Glu Leu Ala Ser Ile Ala Ala Lys Leu Asn
145                 150                 155                 160

gca ttt gct tac att tca tgt caa ggg tgt aaa acg aaa gaa caa gcg   529
Ala Phe Ala Tyr Ile Ser Cys Gln Gly Cys Lys Thr Lys Glu Gln Ala
                165                 170                 175

gtg caa tat aaa cgc aac ttc tca caa cgt gaa gtc atg ctg atc atg   577
Val Gln Tyr Lys Arg Asn Phe Ser Gln Arg Glu Val Met Leu Ile Met
```

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            180                 185                 190

ggc gat ttt ctg tca ttt aat gtc aac aca tca aaa gtt gag att gac   625
Gly Asp Phe Leu Ser Phe Asn Val Asn Thr Ser Lys Val Glu Ile Asp
        195                 200                 205

tat gcc gtc act cgt gcg gcg gca atg cgt gca tat ctt gat aaa gaa   673
Tyr Ala Val Thr Arg Ala Ala Ala Met Arg Ala Tyr Leu Asp Lys Glu
    210                 215                 220

cag ggc tgg cat acg tct att tca aat aaa ggc att aat ggc gtg agc   721
Gln Gly Trp His Thr Ser Ile Ser Asn Lys Gly Ile Asn Gly Val Ser
225                 230                 235                 240

ggt gtc aca caa cca ctc tat ttt gac att aac gac agc tcg act gat   769
Gly Val Thr Gln Pro Leu Tyr Phe Asp Ile Asn Asp Ser Ser Thr Asp
                245                 250                 255

gtg aac tat ctc aat gaa caa ggc atc acg tgt tgc gtg aat cat aat   817
Val Asn Tyr Leu Asn Glu Gln Gly Ile Thr Cys Cys Val Asn His Asn
            260                 265                 270

ggc ttt cgt ttt tgg ggc tta cgc acg act gca gaa gat cca tta ttc   865
Gly Phe Arg Phe Trp Gly Leu Arg Thr Thr Ala Glu Asp Pro Leu Phe
        275                 280                 285

aag ttt gaa gtg tac acc cgc act gca caa atc tta aaa gat acg att   913
Lys Phe Glu Val Tyr Thr Arg Thr Ala Gln Ile Leu Lys Asp Thr Ile
    290                 295                 300

gca ggg gcg ttt gat tgg gca gtg gat aaa gat att tct gtc acg cta   961
Ala Gly Ala Phe Asp Trp Ala Val Asp Lys Asp Ile Ser Val Thr Leu
305                 310                 315                 320

gtg aaa gat att att gaa gca atc aat gcg aag tgg cgt gat tac acc  1009
Val Lys Asp Ile Ile Glu Ala Ile Asn Ala Lys Trp Arg Asp Tyr Thr
                325                 330                 335

aca aaa ggc tac tta att ggc ggt aaa gcg tgg ctt aat aaa gag ctt  1057
Thr Lys Gly Tyr Leu Ile Gly Gly Lys Ala Trp Leu Asn Lys Glu Leu
            340                 345                 350

aac agt gca acg aat tta aaa gat gcg aag ttg ttg atc tct tat gat  1105
Asn Ser Ala Thr Asn Leu Lys Asp Ala Lys Leu Leu Ile Ser Tyr Asp
        355                 360                 365

tat cac cca gta cca ccg ctc gaa cag cta ggc ttt aat cag tac att  1153
Tyr His Pro Val Pro Pro Leu Glu Gln Leu Gly Phe Asn Gln Tyr Ile
    370                 375                 380

tct gat gaa tac ctt gtt gat ttt tca aat cgt tta gca tcg          1195
Ser Asp Glu Tyr Leu Val Asp Phe Ser Asn Arg Leu Ala Ser
385                 390                 395

taaggggtag aaaatggctt taccacgcaa acttaaattg atgaatttaa tcatcgacgg 1255

taacaaatat ctcggcgaag tcacggaagt gactcaacca aaattagcaa tgaaaatcga 1315

agaatttcgc gcgggcggta tgattggttc ggtggatgtc aatctcgggc ttgaaaagct 1375

cgaagcggaa tttaaagccg gtggctacat ggtcgaatta attaaaaaat tcggcgggtc 1435

aatcaacggc attccattgc gttttcttgg ctcatatcag cgtgatgaca cagaagaagt 1495
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cacatctgtt gagcttgtga tgcaaggtcg atttactgaa attgacagcg gaaacagcaa 1555

agtgggcgat gacactgaac aaacattcaa agtgccttta acgtattaca aaatcattgt 1615

tga 1618

<210> 50
<211> 398
<212> PRT
<213> Pasteurella multocida

<400> 50

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Gly Asp Leu Cys Leu Lys Ile Ser Thr Trp Cys Gln Ser His Arg Ile
  1               5                  10                  15

Asn Gln Ala Ile Arg Thr Ile Gln Ser Leu Ser Thr Ala Val Ile Gly
            20                  25                  30

Ile Val Cys Thr Ala Asn Asp Ala Asp Asn Glu Thr Phe Pro Leu Asn
        35                  40                  45

Glu Pro Val Leu Ile Thr Asn Val Ala Ala Ala Ile Gly Lys Ala Gly
    50                  55                  60

Lys Gln Gly Thr Leu Ser Arg Ala Leu Asp Gly Ile Ser Asp Val Val
65                  70                  75                  80

Asn Cys Lys Val Ile Val Val Arg Val Gln Glu Ser Ala Gln Glu Asp
                85                  90                  95

Glu Glu Thr Lys Ala Ser Glu Met Asn Thr Ala Ile Ile Gly Thr Ile
            100                 105                 110

Thr Glu Glu Gly Gln Tyr Thr Gly Leu Lys Ala Leu Leu Ile Ala Lys
        115                 120                 125

Asn Lys Phe Gly Ile Lys Pro Arg Ile Leu Cys Val Pro Lys Phe Asp
    130                 135                 140

Thr Lys Glu Val Ala Thr Glu Leu Ala Ser Ile Ala Ala Lys Leu Asn
145                 150                 155                 160

Ala Phe Ala Tyr Ile Ser Cys Gln Gly Cys Lys Thr Lys Glu Gln Ala
                165                 170                 175

Val Gln Tyr Lys Arg Asn Phe Ser Gln Arg Glu Val Met Leu Ile Met
            180                 185                 190

Gly Asp Phe Leu Ser Phe Asn Val Asn Thr Ser Lys Val Glu Ile Asp
        195                 200                 205

Tyr Ala Val Thr Arg Ala Ala Ala Met Arg Ala Tyr Leu Asp Lys Glu
    210                 215                 220

Gln Gly Trp His Thr Ser Ile Ser Asn Lys Gly Ile Asn Gly Val Ser
225                 230                 235                 240

Gly Val Thr Gln Pro Leu Tyr Phe Asp Ile Asn Asp Ser Ser Thr Asp
                245                 250                 255

Val Asn Tyr Leu Asn Glu Gln Gly Ile Thr Cys Cys Val Asn His Asn
            260                 265                 270
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Gly Phe Arg Phe Trp Gly Leu Arg Thr Thr Ala Glu Asp Pro Leu Phe
        275                 280                 285

Lys Phe Glu Val Tyr Thr Arg Thr Ala Gln Ile Leu Lys Asp Thr Ile
    290                 295                 300

Ala Gly Ala Phe Asp Trp Ala Val Asp Lys Asp Ile Ser Val Thr Leu
305                 310                 315                 320

Val Lys Asp Ile Ile Glu Ala Ile Asn Ala Lys Trp Arg Asp Tyr Thr
                325                 330                 335

Thr Lys Gly Tyr Leu Ile Gly Gly Lys Ala Trp Leu Asn Lys Glu Leu
            340                 345                 350

Asn Ser Ala Thr Asn Leu Lys Asp Ala Lys Leu Leu Ile Ser Tyr Asp
        355                 360                 365

Tyr His Pro Val Pro Pro Leu Glu Gln Leu Gly Phe Asn Gln Tyr Ile
    370                 375                 380


Ser Asp Glu Tyr Leu Val Asp Phe Ser Asn Arg Leu Ala Ser
385                 390                 395


<210> 51
<211> 353
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (1)..(351)

<220>
<223> unknown C1

<400> 51
atg aca tta ttt gat gaa tgt aaa tta gct ctt aga gac gat ttt aat   48
Met Thr Leu Phe Asp Glu Cys Lys Leu Ala Leu Arg Asp Asp Phe Asn
  1               5                  10                  15

cta att tgt gat gaa gag aag gat tgt gta atg gat aag ttt tat ttc   96
Leu Ile Cys Asp Glu Glu Lys Asp Cys Val Met Asp Lys Phe Tyr Phe
            20                  25                  30

tat ttc ttg gaa aag aaa gag gaa ttt aat ttt caa gat tat tca ttt   144
Tyr Phe Leu Glu Lys Lys Glu Glu Phe Asn Phe Gln Asp Tyr Ser Phe
        35                  40                  45

gaa gaa atg tat ata ttt tca aaa atg gaa cct gtg tat gtt tta tgt   192
Glu Glu Met Tyr Ile Phe Ser Lys Met Glu Pro Val Tyr Val Leu Cys
    50                  55                  60

gat agc tct aat ata cct ttg ttt agg agt aat tgg gaa ttg att atc   240
Asp Ser Ser Asn Ile Pro Leu Phe Arg Ser Asn Trp Glu Leu Ile Ile
65                  70                  75                  80

aat aat ata tat gat gtt gtc tgt tta tct aca aaa gta ttt ttt cta   288
Asn Asn Ile Tyr Asp Val Val Cys Leu Ser Thr Lys Val Phe Phe Leu
                85                  90                  95
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gat gat gaa aag tta atg atg gaa tta ttt cct gaa gat aaa gta aga   336
Asp Asp Glu Lys Leu Met Met Glu Leu Phe Pro Glu Asp Lys Val Arg
            100                 105                 110

gtc atc tat aaa aga ta                                         353
Val Ile Tyr Lys Arg
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<210> 52
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<213> Pasteurella multocida

<400> 52

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Leu Ile Cys Asp Glu Glu Lys Asp Cys Val Met Asp Lys Phe Tyr Phe
             20                  25                  30

Tyr Phe Leu Glu Lys Lys Glu Glu Phe Asn Phe Gln Asp Tyr Ser Phe
         35                  40                  45

Glu Glu Met Tyr Ile Phe Ser Lys Met Glu Pro Val Tyr Val Leu Cys
     50                  55                  60

Asp Ser Ser Asn Ile Pro Leu Phe Arg Ser Asn Trp Glu Leu Ile Ile
 65                  70                  75                  80

Asn Asn Ile Tyr Asp Val Val Cys Leu Ser Thr Lys Val Phe Phe Leu
                 85                  90                  95

Asp Asp Glu Lys Leu Met Met Glu Leu Phe Pro Glu Asp Lys Val Arg
            100                 105                 110

Val Ile Tyr Lys Arg
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gat aag gaa att ata tta gaa ttc gaa aat gaa ttt aat ata aag ctt   96
Asp Lys Glu Ile Ile Leu Glu Phe Glu Asn Glu Phe Asn Ile Lys Leu
             20                  25                  30

cct tct tta tac ata gat tta att acg gcg cat aat gct ccg aag agt  144
Pro Ser Leu Tyr Ile Asp Leu Ile Thr Ala His Asn Ala Pro Lys Ser
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         35                  40                  45

gaa gag aat tgc ttt gaa tat tac aat gag cgt aat gag ccc acg ttt   192
Glu Glu Asn Cys Phe Glu Tyr Tyr Asn Glu Arg Asn Glu Pro Thr Phe
     50                  55                  60

tct tcc ttt gga ttt gaa ggg ttt gag aca gag cgg tct agc gcc tct   240
Ser Ser Phe Gly Phe Glu Gly Phe Glu Thr Glu Arg Ser Ser Ala Ser
 65                  70                  75                  80

ctt gaa aat ata tat gct cag tat att tat gat gat cca atc tat ggt   288
Leu Glu Asn Ile Tyr Ala Gln Tyr Ile Tyr Asp Asp Pro Ile Tyr Gly
                 85                  90                  95

tat gaa cat gtg tat tct ttt ggt agt act ggc gag gga cat ttt atc   336
Tyr Glu His Val Tyr Ser Phe Gly Ser Thr Gly Glu Gly His Phe Ile
            100                 105                 110


tgt ttt gat tat cgt gat gat cca aaa ggt gat gaa ccc aaa atc tgt   384
Cys Phe Asp Tyr Arg Asp Asp Pro Lys Gly Asp Glu Pro Lys Ile Cys
        115                 120                 125

atc gtg att cac gat gaa tat gat gaa aaa aca ggg aaa atg cga ctg   432
Ile Val Ile His Asp Glu Tyr Asp Glu Lys Thr Gly Lys Met Arg Leu
    130                 135                 140

ttt cct ata gca gag aat ttt gaa gcg ttt tta gat agt ttg aaa tca   480
Phe Pro Ile Ala Glu Asn Phe Glu Ala Phe Leu Asp Ser Leu Lys Ser
145                 150                 155                 160

ttt gat gaa atg ata gag aag tat tcg ta                           509
Phe Asp Glu Met Ile Glu Lys Tyr Ser
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<210> 54
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<213> Pasteurella multocida

<400> 54
Met Lys Asn Phe Arg Asn Ile Asn Ile Tyr Ser Asp Tyr Gly Lys Val
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Asp Lys Glu Ile Ile Leu Glu Phe Glu Asn Glu Phe Asn Ile Lys Leu
             20                  25                  30

Pro Ser Leu Tyr Ile Asp Leu Ile Thr Ala His Asn Ala Pro Lys Ser
         35                  40                  45

Glu Glu Asn Cys Phe Glu Tyr Tyr Asn Glu Arg Asn Glu Pro Thr Phe
     50                  55                  60

Ser Ser Phe Gly Phe Glu Gly Phe Glu Thr Glu Arg Ser Ser Ala Ser
 65                  70                  75                  80

Leu Glu Asn Ile Tyr Ala Gln Tyr Ile Tyr Asp Asp Pro Ile Tyr Gly
                 85                  90                  95

Tyr Glu His Val Tyr Ser Phe Gly Ser Thr Gly Glu Gly His Phe Ile
            100                 105                 110
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```
Cys Phe Asp Tyr Arg Asp Asp Pro Lys Gly Asp Glu Pro Lys Ile Cys
        115                 120                 125

Ile Val Ile His Asp Glu Tyr Asp Glu Lys Thr Gly Lys Met Arg Leu
    130                 135                 140

Phe Pro Ile Ala Glu Asn Phe Glu Ala Phe Leu Asp Ser Leu Lys Ser
145                 150                 155                 160

Phe Asp Glu Met Ile Glu Lys Tyr Ser
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<400> 55

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  1               5                  10                  15

ggt aaa aac gaa agt aat aaa gat att tta aaa tta gta gaa ata gtt   96
Gly Lys Asn Glu Ser Asn Lys Asp Ile Leu Lys Leu Val Glu Ile Val
            20                  25                  30

tct tca gat ttt gaa gtg gat gaa cta agt cat aaa gat gaa cac gag   144
Ser Ser Asp Phe Glu Val Asp Glu Leu Ser His Lys Asp Glu His Glu
        35                  40                  45

ata tat tat ttg ttt tat aag agg ggt gtt gaa ttt tgt ttt aaa aga   192
Ile Tyr Tyr Leu Phe Tyr Lys Arg Gly Val Glu Phe Cys Phe Lys Arg
    50                  55                  60

ata gat gaa gag tat gtc tta tat tcg gtt ttc ttt ttc ttg gta gag   240
Ile Asp Glu Glu Tyr Val Leu Tyr Ser Val Phe Phe Phe Leu Val Glu
65                  70                  75                  80

gtt gat aat tat ttt tca tgc cca ttt att cat gaa tta ata tgt gat   288
Val Asp Asn Tyr Phe Ser Cys Pro Phe Ile His Glu Leu Ile Cys Asp
                85                  90                  95

ctt aaa cac gga ttc tca ata gag gat att ata agg ttt tta ggg gag   336
Leu Lys His Gly Phe Ser Ile Glu Asp Ile Ile Arg Phe Leu Gly Glu
            100                 105                 110

cca aat ttt aaa ggt agt ggc tgg gta aga tat tct tat aat gga aga   384
Pro Asn Phe Lys Gly Ser Gly Trp Val Arg Tyr Ser Tyr Asn Gly Arg
        115                 120                 125

aat att cat ttc gaa ttt aat gaa tct aat gaa tta tcc cag att agc   432
Asn Ile His Phe Glu Phe Asn Glu Ser Asn Glu Leu Ser Gln Ile Ser
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att ttt att ta                                                   443
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Ile Phe Ile
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<210> 56
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<213> Pasteurella multocida

<400> 56
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20 25 30

Ser Ser Asp Phe Glu Val Asp Glu Leu Ser His Lys Asp Glu His Glu
35 40 45

Ile Tyr Tyr Leu Phe Tyr Lys Arg Gly Val Glu Phe Cys Phe Lys Arg
50 55 60

Ile Asp Glu Glu Tyr Val Leu Tyr Ser Val Phe Phe Phe Leu Val Glu
65 70 75 80

Val Asp Asn Tyr Phe Ser Cys Pro Phe Ile His Glu Leu Ile Cys Asp
85 90 95

Leu Lys His Gly Phe Ser Ile Glu Asp Ile Ile Arg Phe Leu Gly Glu
100 105 110

Pro Asn Phe Lys Gly Ser Gly Trp Val Arg Tyr Ser Tyr Asn Gly Arg
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Asn Ile His Phe Glu Phe Asn Glu Ser Asn Glu Leu Ser Gln Ile Ser
130 135 140

Ile Phe Ile
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                                                Met Lys Lys Leu
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tat tta att cgt tct tgc tat gat tca gtc aga aaa ttt tat gag aat   2745
Tyr Leu Ile Arg Ser Cys Tyr Asp Ser Val Arg Lys Phe Tyr Glu Asn
  5                  10                  15                  20

gag cta ggt gtt tat aca gta atg act gca tta cta gca ttt cca tta   2793
Glu Leu Gly Val Tyr Thr Val Met Thr Ala Leu Leu Ala Phe Pro Leu
                 25                  30                  35
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tta gtt ttg att gga ttt acg gtt gat gga act ggg gtt gtg ctt gat   2841
Leu Val Leu Ile Gly Phe Thr Val Asp Gly Thr Gly Val Val Leu Asp
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aaa gca cgt tta gct caa gga atg gat caa gct gct tta gct ttg gtt   2889
Lys Ala Arg Leu Ala Gln Gly Met Asp Gln Ala Ala Leu Ala Leu Val
        55                  60                  65

gct gaa aac aat gac tac cga gaa aat aaa aaa cat ggt gat gtt aat   2937
Ala Glu Asn Asn Asp Tyr Arg Glu Asn Lys Lys His Gly Asp Val Asn
    70                  75                  80

cgg caa gta gta tcg cct caa gac aaa gca aaa ttt ggt ggt aat gaa   2985
Arg Gln Val Val Ser Pro Gln Asp Lys Ala Lys Phe Gly Gly Asn Glu
85                  90                  95                  100

ttt atg gcg aaa caa gaa aag cgt aat caa gag ctt atc cag ggt att   3033
Phe Met Ala Lys Gln Glu Lys Arg Asn Gln Glu Leu Ile Gln Gly Ile
                105                 110                 115

gcc aaa ctt tat tta cgt tca gaa aat gcg aat gct tca tct gat gca   3081
Ala Lys Leu Tyr Leu Arg Ser Glu Asn Ala Asn Ala Ser Ser Asp Ala
            120                 125                 130

cca atc act att gat aaa cct ttt cat tat tca tgt gag gag tta gat   3129
Pro Ile Thr Ile Asp Lys Pro Phe His Tyr Ser Cys Glu Glu Leu Asp
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tta cct aca gct aat gag tat gca cgt cgt aaa cct att gtt tgt gaa   3177
Leu Pro Thr Ala Asn Glu Tyr Ala Arg Arg Lys Pro Ile Val Cys Glu
    150                 155                 160

gtg caa ggt ggc gtc aat cgt aaa ttt tgg ctt cct gtc agt gaa tcg   3225
Val Gln Gly Gly Val Asn Arg Lys Phe Trp Leu Pro Val Ser Glu Ser
165                 170                 175                 180

tta gtt agt gaa gat aaa ctg aaa aaa gat cga gtt aga ctg gaa tcc   3273
Leu Val Ser Glu Asp Lys Leu Lys Lys Asp Arg Val Arg Leu Glu Ser
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gat acc agt tat gcg att aaa gaa aaa ggc atc gtg att cct gtg gag   3321
Asp Thr Ser Tyr Ala Ile Lys Glu Lys Gly Ile Val Ile Pro Val Glu
            200                 205                 210

cta atg ctt gtt tcg gat tat tct ggt tcg atg aat agt cat tta cag   3369
Leu Met Leu Val Ser Asp Tyr Ser Gly Ser Met Asn Ser His Leu Gln
        215                 220                 225

gat aaa aac ggt aga tct cta gga aaa gct aaa att act att tta aga   3417
Asp Lys Asn Gly Arg Ser Leu Gly Lys Ala Lys Ile Thr Ile Leu Arg
    230                 235                 240

gaa gtg gtt agt gaa att tcg aaa att tta ttg cca gaa gat gtt agc   3465
Glu Val Val Ser Glu Ile Ser Lys Ile Leu Leu Pro Glu Asp Val Ser
245                 250                 255                 260

gaa ggt gtg agc cct ttc aac cgt att ggc ttt acg act ttt tct ggc   3513
Glu Gly Val Ser Pro Phe Asn Arg Ile Gly Phe Thr Thr Phe Ser Gly
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ggt gtt aga caa cgg gat gtc act gaa ggc tgt gtg ctt cca tat gaa   3561
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Gly Val Arg Gln Arg Asp Val Thr Glu Gly Cys Val Leu Pro Tyr Glu
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gga aaa ata tca caa act tct cga aaa tta act att cgt tat tgg att   3609
Gly Lys Ile Ser Gln Thr Ser Arg Lys Leu Thr Ile Arg Tyr Trp Ile
        295                 300                 305

acg ggt aat aat aca cct tgg aaa ttt aat gct ggg aga tgg gag aga   3657
Thr Gly Asn Asn Thr Pro Trp Lys Phe Asn Ala Gly Arg Trp Glu Arg
    310                 315                 320

agt aca gtg tct ttc cag gag cat tat aaa ggc tat tat gac aaa ttc   3705
Ser Thr Val Ser Phe Gln Glu His Tyr Lys Gly Tyr Tyr Asp Lys Phe
325                 330                 335                 340

cat tct tca act tgt aga ggc tca ggg agc tct aga act tgt caa att   3753
His Ser Ser Thr Cys Arg Gly Ser Gly Ser Ser Arg Thr Cys Gln Ile
                345                 350                 355

gat gca aat cct aag aaa att atg gat tat gca cta aaa att aat gac   3801
Asp Ala Asn Pro Lys Lys Ile Met Asp Tyr Ala Leu Lys Ile Asn Asp
            360                 365                 370

tgg acg aca att aga gaa tta ttt aat act tat ata gat gta agt ggg   3849
Trp Thr Thr Ile Arg Glu Leu Phe Asn Thr Tyr Ile Asp Val Ser Gly
        375                 380                 385

acg att gac caa att tcc cag ttt gat ggt tca aac aga cgt tat gat   3897
Thr Ile Asp Gln Ile Ser Gln Phe Asp Gly Ser Asn Arg Arg Tyr Asp
    390                 395                 400

atg gtg ttt act gat gaa gaa cgg tgt ctt ggc gga aat att ggt aga   3945
Met Val Phe Thr Asp Glu Glu Arg Cys Leu Gly Gly Asn Ile Gly Arg
405                 410                 415                 420

aga aca act cga gct tgg ttt gat caa aaa aat aaa gat att aca aga   3993
Arg Thr Thr Arg Ala Trp Phe Asp Gln Lys Asn Lys Asp Ile Thr Arg
                425                 430                 435

gag ttg aat att gtt cgt cct tct ggt tgg act tct gca tct tcg ggg   4041
Glu Leu Asn Ile Val Arg Pro Ser Gly Trp Thr Ser Ala Ser Ser Gly
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ctt ctt gtt gga gct aat atc atg atg gac gag aat aag aat cct gat   4089
Leu Leu Val Gly Ala Asn Ile Met Met Asp Glu Asn Lys Asn Pro Asp
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gcg caa cct tcg aaa ctc ggg aca aat att caa cgt gtt atc tta gta   4137
Ala Gln Pro Ser Lys Leu Gly Thr Asn Ile Gln Arg Val Ile Leu Val
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tta tct gat ggt gaa gat aac tgg cca act tat agt aca tta acg act   4185
Leu Ser Asp Gly Glu Asp Asn Trp Pro Thr Tyr Ser Thr Leu Thr Thr
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ctt tta aac aat ggt atg tgt gac aaa att cga gaa caa ttg ggc aag   4233
Leu Leu Asn Asn Gly Met Cys Asp Lys Ile Arg Glu Gln Leu Gly Lys
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tta caa gat cca aat tta cga gag tta cca gga aga att gcg ttt gtt   4281
Leu Gln Asp Pro Asn Leu Arg Glu Leu Pro Gly Arg Ile Ala Phe Val
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gcg ttt ggc tat agt cca cca gca aac caa gtt gcc gct tgg aaa aaa   4329
Ala Phe Gly Tyr Ser Pro Pro Ala Asn Gln Val Ala Ala Trp Lys Lys
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tgt gta ggt gat caa tat tat acg gct tat tcg aaa gaa gag ttg tta   4377
Cys Val Gly Asp Gln Tyr Tyr Thr Ala Tyr Ser Lys Glu Glu Leu Leu
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gat agt ttc aaa caa att att gga ttt gaa gaa gag gtg ggg cgt tct   4425
Asp Ser Phe Lys Gln Ile Ile Gly Phe Glu Glu Glu Val Gly Arg Ser
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Ser Ser His Lys Pro Lys Phe
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ttaattcatt acataacata acttttttcgt gaataataca gaatagacaa caataagaat 4596

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35 40 45

Val Val Leu Asp Lys Ala Arg Leu Ala Gln Gly Met Asp Gln Ala Ala
50 55 60

Leu Ala Leu Val Ala Glu Asn Asn Asp Tyr Arg Glu Asn Lys Lys His
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Gly Asp Val Asn Arg Gln Val Val Ser Pro Gln Asp Lys Ala Lys Phe
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Gly Gly Asn Glu Phe Met Ala Lys Gln Glu Lys Arg Asn Gln Glu Leu
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Ile Gln Gly Ile Ala Lys Leu Tyr Leu Arg Ser Glu Asn Ala Asn Ala
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Ser Ser Asp Ala Pro Ile Thr Ile Asp Lys Pro Phe His Tyr Ser Cys
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Glu Glu Leu Asp Leu Pro Thr Ala Asn Glu Tyr Ala Arg Arg Lys Pro
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Ile Val Cys Glu Val Gln Gly Gly Val Asn Arg Lys Phe Trp Leu Pro
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Val Ser Glu Ser Leu Val Ser Glu Asp Lys Leu Lys Lys Asp Arg Val
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Arg Leu Glu Ser Asp Thr Ser Tyr Ala Ile Lys Glu Lys Gly Ile Val
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Ile Pro Val Glu Leu Met Leu Val Ser Asp Tyr Ser Gly Ser Met Asn
210 215 220

Ser His Leu Gln Asp Lys Asn Gly Arg Ser Leu Gly Lys Ala Lys Ile
225 230 235 240

Thr Ile Leu Arg Glu Val Val Ser Glu Ile Ser Lys Ile Leu Leu Pro
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Glu Asp Val Ser Glu Gly Val Ser Pro Phe Asn Arg Ile Gly Phe Thr
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Arg Tyr Trp Ile Thr Gly Asn Asn Thr Pro Trp Lys Phe Asn Ala Gly
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Arg Trp Glu Arg Ser Thr Val Ser Phe Gln Glu His Tyr Lys Gly Tyr
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Tyr Asp Lys Phe His Ser Ser Thr Cys Arg Gly Ser Gly Ser Ser Arg
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Thr Cys Gln Ile Asp Ala Asn Pro Lys Lys Ile Met Asp Tyr Ala Leu
        355                 360                 365

Lys Ile Asn Asp Trp Thr Thr Ile Arg Glu Leu Phe Asn Thr Tyr Ile
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Asp Val Ser Gly Thr Ile Asp Gln Ile Ser Gln Phe Asp Gly Ser Asn
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Arg Arg Tyr Asp Met Val Phe Thr Asp Glu Glu Arg Cys Leu Gly Gly
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Asn Ile Gly Arg Arg Thr Thr Arg Ala Trp Phe Asp Gln Lys Asn Lys
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Asp Ile Thr Arg Glu Leu Asn Ile Val Arg Pro Ser Gly Trp Thr Ser
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Ala Ser Ser Gly Leu Leu Val Gly Ala Asn Ile Met Met Asp Glu Asn
    450                 455                 460

Lys Asn Pro Asp Ala Gln Pro Ser Lys Leu Gly Thr Asn Ile Gln Arg
465                 470                 475                 480

Val Ile Leu Val Leu Ser Asp Gly Glu Asp Asn Trp Pro Thr Tyr Ser
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Thr Leu Thr Thr Leu Leu Asn Asn Gly Met Cys Asp Lys Ile Arg Glu
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Gln Leu Gly Lys Leu Gln Asp Pro Asn Leu Arg Glu Leu Pro Gly Arg
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Ile Ala Phe Val Ala Phe Gly Tyr Ser Pro Pro Ala Asn Gln Val Ala
    530                 535                 540

Ala Trp Lys Lys Cys Val Gly Asp Gln Tyr Tyr Thr Ala Tyr Ser Lys
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Val Gly Arg Ser Ser Ser His Lys Pro Lys Phe
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Lys Lys Ile Val Phe Val Ser Leu Ala Leu Ser Val Val Gly Cys Ser
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acc cat tct cag caa ggc atg aca cag aaa agt atg tca tct gaa aca 811
Thr His Ser Gln Gln Gly Met Thr Gln Lys Ser Met Ser Ser Glu Thr
        25   30   35

ata acg gca aaa gag act tta tat gaa agt acg caa aat tat tcg gca 859
Ile Thr Ala Lys Glu Thr Leu Tyr Glu Ser Thr Gln Asn Tyr Ser Ala
    40   45   50

ctc att tca ctg tat cgc gat gtg ttg aaa gcc aaa gaa gat cct tca 907
Leu Ile Ser Leu Tyr Arg Asp Val Leu Lys Ala Lys Glu Asp Pro Ser
55   60   65   70

ata cgc tat aaa tta gcg aag aca tac tat cag cga ggt gac agc aaa 955
Ile Arg Tyr Lys Leu Ala Lys Thr Tyr Tyr Gln Arg Gly Asp Ser Lys
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gct aca caa gcg aaa ata tta cag ata aaa aat cta att caa tta aat 1051
Ala Thr Gln Ala Lys Ile Leu Gln Ile Lys Asn Leu Ile Gln Leu Asn
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Asn Phe Gln Glu Ala Ile Ser Val Ala Asn Glu Leu Leu Leu Lys Ser
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Pro Asn Glu Gly Glu Val Tyr Asn Leu Arg Gly Ile Ala Tyr Ala Gln
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Phe Phe Ile Asn Asp Asn Val Ala Ile Asn Asn Leu Ala Met Leu Asn
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Tyr Leu Asn Gly Val Lys Asn Ser Arg Leu Ile His Asn Leu Val Phe
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gct tta gtt aaa aat ggt gat ctt gat tat gca aaa gat atc att gtt   1387
Ala Leu Val Lys Asn Gly Asp Leu Asp Tyr Ala Lys Asp Ile Ile Val
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Lys Glu Arg Leu Asn Thr Ser Pro Asp Asp Leu Ile Asn Ala Leu Lys
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Lys Thr Thr His Val Ser Lys Gly Val Thr Arg
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atggcgaaac aagaaaagcg taatcaagag cttatccagg gtattgccaa actttattta 3048

cgttcagaaa atgcgaatgc ttcatctgat gcaccaatca ctattgataa acctttttcat 3108

tattcatgtg aggagttaga tttacctaca gctaatgagt atgcacgtcg taaacctatt 3168

gtttgtgaag tgcaaggtgg cgtcaatcgt aaattttggc ttcctgtcag tgaatcgtta 3228

gttagtgaag ataaactgaa aaaagatcga gttagactgg aatccgatac cagttatgcg 3288

attaaagaaa aaggcatcgt gattcctgtg gagctaatgc ttgtttcgga ttattctggt 3348

tcgatgaata gtcatttaca ggataaaaac ggtagatctc taggaaaagc taaaattact 3408

attttaagag aagtggttag tgaaatttcg aaaattttat tgccagaaga tgttagcgaa 3468

ggtgtgagcc ctttcaaccg tattggcttt acgacttttt ctggcggtgt tagacaacgg 3528

gatgtcactg aaggctgtgt gcttccatat gaaggaaaaa tatcacaaac ttctcgaaaa 3588

ttaactattc gttattggat tacgggtaat aatacacctt ggaaatttaa tgctgggaga 3648

tgggagagaa gtacagtgtc tttccaggag cattataaag gctattatga caaattccat 3708

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aaaattatgg attatgcact aaaaattaat gactggacga caattagaga attatttaat 3828

acttatatag atgtaagtgg gacgattgac caaatttccc agtttgatgg ttcaaacaga 3888

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acaactcgag cttggtttga tcaaaaaaat aaagatatta caagagagtt gaatattgtt 4008

cgtccttctg gttggacttc tgcatcttcg gggcttcttg ttggagctaa tatcatgatg 4068

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gaagcgattt ttcttttggc tgaaaggtgg tgttagcctt tttcggctaa agaaaatagt 4788

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gtttacgcga gtacgtacta gcgtaccggc atcagtaatg agcataattt gatcgctttc 5328

ctcaacttgt gttgctgcaa cgactttacc gttacgctca ctcactttaa tcgagatcac 5388

gcctttggtg ttacgtgatt tagttgggta ttccgctaat tcagtacgtt taccataacc 5448

gttttgtgtg gcggttaaaa tggcgccttc atttttgga ataacaagtg acacgacttt 5508

atcaatattg agatccaagg catcattagt attctcatca gagatctctt ccatatcgac 5568

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tgctgcacgc cccatggcac gcacagcatt ttcactaaag cgaactacac gtccttgtgc 5688

ggagaagagc atgatttcat tttgaccatc ggtgatatcc acaccgataa gttcgtcttc 5748

atcacgcaag ttgagtgcaa taatgcctgt tgaacgagga cgactgaatt 5798

<210> 61
<211> 257
<212> PRT
<213> Pasteurella multocida

<400> 61
Met Phe Phe Lys Phe Thr Lys Lys Ile Val Phe Val Ser Leu Ala Leu
1 5 10 15

Ser Val Val Gly Cys Ser Thr His Ser Gln Gln Gly Met Thr Gln Lys
20 25 30

Ser Met Ser Ser Glu Thr Ile Thr Ala Lys Glu Thr Leu Tyr Glu Ser
35 40 45

```
Thr Gln Asn Tyr Ser Ala Leu Ile Ser Leu Tyr Arg Asp Val Leu Lys
     50                  55                  60

Ala Lys Glu Asp Pro Ser Ile Arg Tyr Lys Leu Ala Lys Thr Tyr Tyr
 65                  70                  75                  80

Gln Arg Gly Asp Ser Lys Ser Ser Leu Leu Tyr Leu Thr Pro Leu Leu
                 85                  90                  95

Asn Asp Asn Thr Lys Leu Ala Thr Gln Ala Lys Ile Leu Gln Ile Lys
            100                 105                 110

Asn Leu Ile Gln Leu Asn Asn Phe Gln Glu Ala Ile Ser Val Ala Asn
        115                 120                 125

Glu Leu Leu Leu Lys Ser Pro Asn Glu Gly Glu Val Tyr Asn Leu Arg
    130                 135                 140

Gly Ile Ala Tyr Ala Gln Asn Gly Asn Leu Val Asn Ala Arg Asn Asp
145                 150                 155                 160

Ile Asn Lys Ala Arg Glu Phe Phe Ile Asn Asp Asn Val Ala Ile Asn
                165                 170                 175

Asn Leu Ala Met Leu Asn Ile Ile Asn Gly Asp Phe Asn Asn Ala Val
            180                 185                 190

Ser Leu Leu Leu Pro Gln Tyr Leu Asn Gly Val Lys Asn Ser Arg Leu
        195                 200                 205

Ile His Asn Leu Val Phe Ala Leu Val Lys Asn Gly Asp Leu Asp Tyr
    210                 215                 220

Ala Lys Asp Ile Ile Val Lys Glu Arg Leu Asn Thr Ser Pro Asp Asp
225                 230                 235                 240

Leu Ile Asn Ala Leu Lys Lys Thr Thr His Val Ser Lys Gly Val Thr
                245                 250                 255

Arg
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<210> 62
<211> 1788
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (1)..(600)

<220>
<223> unknown K

<400> 62

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gtc aac act ggg cta att cac agt aac ggt aat gcc aag ctc act ttt   48
Val Asn Thr Gly Leu Ile His Ser Asn Gly Asn Ala Lys Leu Thr Phe
  1               5                  10                  15

aaa gat gac acc agt ttt gtg act gaa gga aat aac ttt atc aca gca   96
Lys Asp Asp Thr Ser Phe Val Thr Glu Gly Asn Asn Phe Ile Thr Ala
             20                  25                  30
```

```
aaa gac aac tta gaa atc acg gca aaa aat gtt caa att gat caa gcg   144
Lys Asp Asn Leu Glu Ile Thr Ala Lys Asn Val Gln Ile Asp Gln Ala
          35                  40                  45

aaa aat att caa tta aac gcg aat atc acg atc aat acc aag tct ggt   192
Lys Asn Ile Gln Leu Asn Ala Asn Ile Thr Ile Asn Thr Lys Ser Gly
      50                  55                  60

ttt gtg aat tac ggt acc tta gca agt gct caa aat tta acg att aat   240
Phe Val Asn Tyr Gly Thr Leu Ala Ser Ala Gln Asn Leu Thr Ile Asn
 65                  70                  75                  80

acc gaa caa ggc agc att tat aac ata ggc ggt atc ttg ggg gcg ggt   288
Thr Glu Gln Gly Ser Ile Tyr Asn Ile Gly Gly Ile Leu Gly Ala Gly
                 85                  90                  95

aaa agt ttg aat ctg agc gcg aaa aga gga gaa aac caa gga gga tat   336
Lys Ser Leu Asn Leu Ser Ala Lys Arg Gly Glu Asn Gln Gly Gly Tyr
            100                 105                 110

ctt att aat caa ggt aag agt cta ctc cat tct gaa ggc gcc atg aac   384
Leu Ile Asn Gln Gly Lys Ser Leu Leu His Ser Glu Gly Ala Met Asn
        115                 120                 125

ctc aca gcg gat cgc acg gtg tac aat tta ggg aat att ttt gct aaa   432
Leu Thr Ala Asp Arg Thr Val Tyr Asn Leu Gly Asn Ile Phe Ala Lys
    130                 135                 140

ggt gac gcg acg atc aat gca aac gcg tta att aat gat gtt act ctc   480
Gly Asp Ala Thr Ile Asn Ala Asn Ala Leu Ile Asn Asp Val Thr Leu
145                 150                 155                 160

aca ggt cgt ctt gag tat caa gat ctg aaa aaa gat tat acg cgt tat   528
Thr Gly Arg Leu Glu Tyr Gln Asp Leu Lys Lys Asp Tyr Thr Arg Tyr
                165                 170                 175

tat cgt atc aat gaa acg gca aaa cat ggt tgg cat aat aac ttc tat   576
Tyr Arg Ile Asn Glu Thr Ala Lys His Gly Trp His Asn Asn Phe Tyr
            180                 185                 190

gaa tta aac gtc gac aga gtt tct tgatttgtgc atcaattttg taaccaccgg  630
Glu Leu Asn Val Asp Arg Val Ser
        195                 200

ttaataaaac accagcaatt tcaacgccat tcatggcaga taatgccgct gcgacgatca 690

catcaggacg atccgcggaa gtgacaagta aacttccaac gcggaaatgt tccaccatat 750

tggtcaaatt acgtgcacag aaagtgatgc cacgaatgcg acgttcattg atcgcgcctt 810

catgaataat ggcagcacct aaatgtttgg ctaaatcaat ggcacgagtc gcaattaatt 870

ctgcgctcca aggaatacat gccaagattt taattgggct tttctcaaat aaatgataaa 930

tctcagatac ttgattttgt gtgtgttgga aagaatcaaa aatttctgcc aagtcagggc 990

gagtacgacc agattcatca atcggcgcat taaatttatt gatcacaaca ccaagtaaat 1050

tagggttatt tttgctgcca aataatgagg ctgcggcttt gatgcgttct ttgagttctg 1110

ccggtgtttc cgtcgccggt gctgcaacaa gaatgatttc cgcatcaagt gcttgagcaa 1170

tttcatagtt aatgctattg gcataagaat gcttacgcgt agggattaaa ccttccacca 1230
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cgacaatttc attgtttttg gcgagttgtt gatgattttc aacaattttt tctagtacca 1290

catcagattg attttgaccg atgagtgatt cagctacact taacataaat ggttcactgg 1350

tttcaatggt ggtactggtg cgaataattg atgttgtgcg atcaatcata tcttcacctg 1410

agttcggctg agaaattggt ttcataaagc cgactttcgc ccctttttgc tccagtgcat 1470

gtgttaaacc taagctgaca ctggttaagc ctacaccagc actaatcggg ataaggataa 1530

ttgtacgtga cataataaac cctaatttgt tgataattta tacaaaaaga aactgccgat 1590

gaatcggcag ttaattgatc tttacgcgat gcaaaggcgc gcggtatctt gtgcaataac 1650

aagttcttca ttcgttggga tcaccatggc aacaggcgta ttgtctgctg taatcacccc 1710

ttcatgacca aagcgagccg ctttgttttt atctgaatcc acttgataac cgaacagttt 1770

taaatggttt aaggttga 1788

<210> 63
<211> 200
<212> PRT
<213> Pasteurella multocida

<400> 63

Val	Asn	Thr	Gly	Leu	Ile	His	Ser	Asn	Gly	Asn	Ala	Lys	Leu	Thr	Phe
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Lys	Asp	Asp	Thr	Ser	Phe	Val	Thr	Glu	Gly	Asn	Asn	Phe	Ile	Thr	Ala
		20					25					30			
Lys	Asp	Asn	Leu	Glu	Ile	Thr	Ala	Lys	Asn	Val	Gln	Ile	Asp	Gln	Ala
	35					40					45				
Lys	Asn	Ile	Gln	Leu	Asn	Ala	Asn	Ile	Thr	Ile	Asn	Thr	Lys	Ser	Gly
50					55					60					
Phe	Val	Asn	Tyr	Gly	Thr	Leu	Ala	Ser	Ala	Gln	Asn	Leu	Thr	Ile	Asn
65				70					75					80	
Thr	Glu	Gln	Gly	Ser	Ile	Tyr	Asn	Ile	Gly	Gly	Ile	Leu	Gly	Ala	Gly
			85					90					95		
Lys	Ser	Leu	Asn	Leu	Ser	Ala	Lys	Arg	Gly	Glu	Asn	Gln	Gly	Gly	Tyr
		100					105					110			
Leu	Ile	Asn	Gln	Gly	Lys	Ser	Leu	Leu	His	Ser	Glu	Gly	Ala	Met	Asn
	115					120					125				
Leu	Thr	Ala	Asp	Arg	Thr	Val	Tyr	Asn	Leu	Gly	Asn	Ile	Phe	Ala	Lys
130					135					140					
Gly	Asp	Ala	Thr	Ile	Asn	Ala	Asn	Ala	Leu	Ile	Asn	Asp	Val	Thr	Leu
145				150					155					160	
Thr	Gly	Arg	Leu	Glu	Tyr	Gln	Asp	Leu	Lys	Lys	Asp	Tyr	Thr	Arg	Tyr
			165					170					175		
Tyr	Arg	Ile	Asn	Glu	Thr	Ala	Lys	His	Gly	Trp	His	Asn	Asn	Phe	Tyr
		180					185					190			

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Glu Leu Asn Val Asp Arg Val Ser
        195                 200


<210> 64
<211> 278
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (108)..(278)

<220>
<223> unknown O

<400> 64
gaattccaac caaatctcac accagagcaa gaacgctaca tagtggaatg gttggcagaa 60

cattacccaa atggaaataa accttaacca tagcaagaga gaagaaa atg aaa att   116
                                                 Met Lys Ile
                                                   1

act att aca cga aat cat cca gaa gta ttt caa gaa tcc gct cgt tta   164
Thr Ile Thr Arg Asn His Pro Glu Val Phe Gln Glu Ser Ala Arg Leu
      5                  10                  15

gta gcc gaa aag ttc att aaa gcc caa tgt gta gaa gca tta aca ttg   212
Val Ala Glu Lys Phe Ile Lys Ala Gln Cys Val Glu Ala Leu Thr Leu
 20                  25                  30                  35

gct ttg att gag ggt gtc gag cac ttt gtg ctg gaa ggt gag gag gaa   260
Ala Leu Ile Glu Gly Val Glu His Phe Val Leu Glu Gly Glu Glu Glu
                 40                  45                  50

agc aaa agg gga cat agt                                           278
Ser Lys Arg Gly His Ser
            55


<210> 65
<211> 57
<212> PRT
<213> Pasteurella multocida

<400> 65
Met Lys Ile Thr Ile Thr Arg Asn His Pro Glu Val Phe Gln Glu Ser
  1               5                  10                  15

Ala Arg Leu Val Ala Glu Lys Phe Ile Lys Ala Gln Cys Val Glu Ala
            20                  25                  30

Leu Thr Leu Ala Leu Ile Glu Gly Val Glu His Phe Val Leu Glu Gly
        35                  40                  45

Glu Glu Glu Ser Lys Arg Gly His Ser
    50                  55


<210> 66
<211> 1020
<212> DNA
<213> Pasteurella multocida
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<220>
<221> CDS
<222> (1)..(597)

<220>
<223> unknown P

<400> 66
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gtc aac aca tca aaa gtt gag att gac tat gcc gtc act cgt gcg gcg   48
Val Asn Thr Ser Lys Val Glu Ile Asp Tyr Ala Val Thr Arg Ala Ala
  1               5                  10                  15

gca atg cgt gca tat ctt gat aaa gaa cag ggc tgg cat acg tct att   96
Ala Met Arg Ala Tyr Leu Asp Lys Glu Gln Gly Trp His Thr Ser Ile
             20                  25                  30

tca aat aaa ggc att aat ggc gtg agc ggt gtc aca caa cca ctc tat   144
Ser Asn Lys Gly Ile Asn Gly Val Ser Gly Val Thr Gln Pro Leu Tyr
         35                  40                  45

ttt gac att aac gac agc tcg act gat gtg aac tat ctc aat gaa caa   192
Phe Asp Ile Asn Asp Ser Ser Thr Asp Val Asn Tyr Leu Asn Glu Gln
     50                  55                  60

ggc atc acg tgt tgc gtg aat cat aat ggc ttt cgt ttt tgg ggc tta   240
Gly Ile Thr Cys Cys Val Asn His Asn Gly Phe Arg Phe Trp Gly Leu
 65                  70                  75                  80

cgc acg act gca gaa gat cca tta ttc aag ttt gaa gtg tac acc cgc   288
Arg Thr Thr Ala Glu Asp Pro Leu Phe Lys Phe Glu Val Tyr Thr Arg
                 85                  90                  95

act gca caa atc tta aaa gat acg att gca ggg gcg ttt gat tgg gca   336
Thr Ala Gln Ile Leu Lys Asp Thr Ile Ala Gly Ala Phe Asp Trp Ala
            100                 105                 110

gtg gat aaa gat att tct gtc acg cta gtg aaa gat att att gaa gca   384
Val Asp Lys Asp Ile Ser Val Thr Leu Val Lys Asp Ile Ile Glu Ala
        115                 120                 125

atc aat gcg aag tgg cgt gat tac acc aca aaa ggc tac tta att ggc   432
Ile Asn Ala Lys Trp Arg Asp Tyr Thr Thr Lys Gly Tyr Leu Ile Gly
    130                 135                 140

ggt aaa gcg tgg ctt aat aaa gag ctt aac agt gca acg aat tta aaa   480
Gly Lys Ala Trp Leu Asn Lys Glu Leu Asn Ser Ala Thr Asn Leu Lys
145                 150                 155                 160

gat gcg aag ttg ttg atc tct tat gat tat cac cca gta cca ccg ctc   528
Asp Ala Lys Leu Leu Ile Ser Tyr Asp Tyr His Pro Val Pro Pro Leu
                165                 170                 175

gaa cag cta ggc ttt aat cag tac att tct gat gaa tac ctt gtt gat   576
Glu Gln Leu Gly Phe Asn Gln Tyr Ile Ser Asp Glu Tyr Leu Val Asp
            180                 185                 190

ttt tca aat cgt tta gca tcg taaggggtag aaaatggctt taccacgcaa      627
Phe Ser Asn Arg Leu Ala Ser
        195

acttaaattg atgaatttaa tcatcgacgg taacaaatat ctcggcgaag tcacggaagt 687

gactcaacca aaattagcaa tgaaaatcga agaatttcgc gcgggcggta tgattggttc 747
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ggtggatgtc aatctcgggc ttgaaaagct cgaagcggaa tttaaagccg gtggctacat 807

ggtcgaatta attaaaaaat tcggcgggtc aatcaacggc attccattgc gttttcttgg 867

ctcatatcag cgtgatgaca cagaagaagt cacatctgtt gagcttgtga tgcaaggtcg 927

atttactgaa attgacagcg gaaacagcaa agtgggcgat gacactgaac aaacattcaa 987

agtgccttta acgtattaca aaatcattgt tga 1020

<210> 67
<211> 199
<212> PRT
<213> Pasteurella multocida

<400> 67

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Val Asn Thr Ser Lys Val Glu Ile Asp Tyr Ala Val Thr Arg Ala Ala
  1               5                  10                  15

Ala Met Arg Ala Tyr Leu Asp Lys Glu Gln Gly Trp His Thr Ser Ile
             20                  25                  30

Ser Asn Lys Gly Ile Asn Gly Val Ser Gly Val Thr Gln Pro Leu Tyr
         35                  40                  45

Phe Asp Ile Asn Asp Ser Ser Thr Asp Val Asn Tyr Leu Asn Glu Gln
     50                  55                  60

Gly Ile Thr Cys Cys Val Asn His Asn Gly Phe Arg Phe Trp Gly Leu
 65                  70                  75                  80

Arg Thr Thr Ala Glu Asp Pro Leu Phe Lys Phe Glu Val Tyr Thr Arg
                 85                  90                  95

Thr Ala Gln Ile Leu Lys Asp Thr Ile Ala Gly Ala Phe Asp Trp Ala
            100                 105                 110

Val Asp Lys Asp Ile Ser Val Thr Leu Val Lys Asp Ile Ile Glu Ala
        115                 120                 125

Ile Asn Ala Lys Trp Arg Asp Tyr Thr Thr Lys Gly Tyr Leu Ile Gly
    130                 135                 140

Gly Lys Ala Trp Leu Asn Lys Glu Leu Asn Ser Ala Thr Asn Leu Lys
145                 150                 155                 160

Asp Ala Lys Leu Leu Ile Ser Tyr Asp Tyr His Pro Val Pro Pro Leu
                165                 170                 175

Glu Gln Leu Gly Phe Asn Gln Tyr Ile Ser Asp Glu Tyr Leu Val Asp
            180                 185                 190

Phe Ser Asn Arg Leu Ala Ser
        195
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<210> 68
<211> 2584
<212> DNA
<213> Pasteurella multocida

<220>

<221> CDS
<222> (1042)..(2286)

<220>
<223> xylA

<400> 68
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taccattatt ttatggaatc tctctggacc gatgaccatt gccaatattg aaattcctca 120

cgcgatggtc tttttggtct ttatttacgt gctgtttagc agtattgtgg catttaaaat 180

cggtcgcccg ttaattcagc tcaattttgc caatgaacgc ttaaacgcca actaccgtta 240

ttcacttatc cgtctgaaag aatatgctga aagcattgct ttttatcgtg gtgaaaaaat 300

ggaaaaacgt ctattgacca cacaatttaa tcaggtgatt gataacgttt ggcaagtaat 360

ctaccgcacc ttgaaattat ccggttttaa cttaatcatt acgcagattt cggtggtttt 420

tccgctggtg attcaagtga cacgttattt tcgtcgacaa taggtgcata tgagggtgtt 480

agaatagcga tactttctgt tggaaaagta aactctttaa tataaataga aatcgcttga 540

atgattctcg ggcaaaaaat aatgtactca tttgcgatct catactgata atggcgaagt 600

aaatatcttc ttacaatatt atggtaatta tcaggtaata ccgtatagcc atagattcca 660

gttctatttt gttttgctaa ataattgatg agcatttgag gcgcaggtaa atccatatct 720

gcaacagaca ttgaaatcat atccttgccg tatttacgag taattgccca tttagcacta 780

tgacaatctg atctatcagt aaaaacatca aacaaattat ccgtcataca tgttctccaa 840

tattggattt atataaactt tagaacttga ggtagattgt tggaattgtt aaatctggta 900

tttctattac gttttttctt ttttgtgata taagccacaa taaccaataa tcttaattgt 960

taagtgaaat aacgtaattg atcctcccat tgttttacta aattatgtct ctgaaactta 1020

tttgttcagg agaaatcatt t atg tcc act tac ttc gac aaa att gaa aaa 1071
Met Ser Thr Tyr Phe Asp Lys Ile Glu Lys
1 5 10

gta aat tat gaa ggt gta act tca tct aat ccg ttt gca tat aag cat 1119
Val Asn Tyr Glu Gly Val Thr Ser Ser Asn Pro Phe Ala Tyr Lys His
15 20 25

tat gat gct aat caa gtt att tta ggt aag acg atg gct gaa cac tta 1167
Tyr Asp Ala Asn Gln Val Ile Leu Gly Lys Thr Met Ala Glu His Leu
30 35 40

cgt tta gcc gtc tgt tat tgg cac act ttc tgt tgg aca ggg aat gat 1215
Arg Leu Ala Val Cys Tyr Trp His Thr Phe Cys Trp Thr Gly Asn Asp
45 50 55

atg ttc ggt gtc ggt tct ttc gat cgt tgt tgg cag aag gcg agt gat 1263
Met Phe Gly Val Gly Ser Phe Asp Arg Cys Trp Gln Lys Ala Ser Asp
60 65 70

tca tta gca ggt gca aaa caa aaa gca gat atc gct ttt gaa ttt ttc 1311
Ser Leu Ala Gly Ala Lys Gln Lys Ala Asp Ile Ala Phe Glu Phe Phe

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 75                  80                  85                  90

agt aaa tta ggc ata cct tat tat tgt ttt cat gat gtt gat gtt gcg   1359
Ser Lys Leu Gly Ile Pro Tyr Tyr Cys Phe His Asp Val Asp Val Ala
                 95                 100                 105

cca gaa ggt cat tca ttt aaa gaa tat ttg tcg aac ttt aat aca atg   1407
Pro Glu Gly His Ser Phe Lys Glu Tyr Leu Ser Asn Phe Asn Thr Met
            110                 115                 120

atc gat gtt tta gcg cag aaa caa gaa gaa aca ggc gtc aaa ttg ttg   1455
Ile Asp Val Leu Ala Gln Lys Gln Glu Glu Thr Gly Val Lys Leu Leu
        125                 130                 135

tgg ggg act gca aat tgt ttt aca cac cct cgt tat atg tct ggt gct   1503
Trp Gly Thr Ala Asn Cys Phe Thr His Pro Arg Tyr Met Ser Gly Ala
    140                 145                 150

gca aca aat ccg aat cca gaa att ttt gct tgg gct gct gca caa gta   1551
Ala Thr Asn Pro Asn Pro Glu Ile Phe Ala Trp Ala Ala Ala Gln Val
155                 160                 165                 170

ttt act gcc atg ggg gca act cag cgt tta ggt ggt gaa aat tat gtt   1599
Phe Thr Ala Met Gly Ala Thr Gln Arg Leu Gly Gly Glu Asn Tyr Val
                175                 180                 185

ttg tgg gga gga cgt gaa gga tat gaa acg tta tta aat acc aat tta   1647
Leu Trp Gly Gly Arg Glu Gly Tyr Glu Thr Leu Leu Asn Thr Asn Leu
            190                 195                 200

aaa cag gag cga gag caa att gga cgt ttc atg caa atg gtg gtt gag   1695
Lys Gln Glu Arg Glu Gln Ile Gly Arg Phe Met Gln Met Val Val Glu
        205                 210                 215

cat aaa tat aaa atc ggt ttt aac ggg act ttg ctg att gaa cca aag   1743
His Lys Tyr Lys Ile Gly Phe Asn Gly Thr Leu Leu Ile Glu Pro Lys
    220                 225                 230

cca caa gag cca acg aaa cat caa tat gac tat gat gtg gcg acc gtt   1791
Pro Gln Glu Pro Thr Lys His Gln Tyr Asp Tyr Asp Val Ala Thr Val
235                 240                 245                 250

tat ggc ttt tta aag cag ttt ggt tta gaa aaa gaa att aaa gtg aat   1839
Tyr Gly Phe Leu Lys Gln Phe Gly Leu Glu Lys Glu Ile Lys Val Asn
                255                 260                 265

att gaa gct aat cac gca aca tta gct gga cac act ttc cag cat gaa   1887
Ile Glu Ala Asn His Ala Thr Leu Ala Gly His Thr Phe Gln His Glu
            270                 275                 280

gtc gcc atg gct aca gcg tta gat att ttt ggt tct att gat gca aat   1935
Val Ala Met Ala Thr Ala Leu Asp Ile Phe Gly Ser Ile Asp Ala Asn
        285                 290                 295

cgt ggt gat cca caa tta ggt tgg gat acc gat caa ttc cct aat agc   1983
Arg Gly Asp Pro Gln Leu Gly Trp Asp Thr Asp Gln Phe Pro Asn Ser
    300                 305                 310

gta gaa gaa aat act ttg gtc ata tat gaa att ctc aaa gca ggg ggc   2031
Val Glu Glu Asn Thr Leu Val Ile Tyr Glu Ile Leu Lys Ala Gly Gly
315                 320                 325                 330

ttt aca acc ggt ggt ttt aat ttt gat gct aaa atc cgt cgg cag agt   2079
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Phe Thr Thr Gly Gly Phe Asn Phe Asp Ala Lys Ile Arg Arg Gln Ser
                335                 340                 345

acg gat cct tac gat tta ttt cat gga cat att ggc gcg att gat gta   2127
Thr Asp Pro Tyr Asp Leu Phe His Gly His Ile Gly Ala Ile Asp Val
            350                 355                 360

ctt gcc tta tca cta aaa tgt gcg gcg aaa atg ctt gaa gag caa gct   2175
Leu Ala Leu Ser Leu Lys Cys Ala Ala Lys Met Leu Glu Glu Gln Ala
        365                 370                 375

tta caa aaa gtc gtc aat caa cgt tat gct ggt tgg aca tca tca ctt   2223
Leu Gln Lys Val Val Asn Gln Arg Tyr Ala Gly Trp Thr Ser Ser Leu
    380                 385                 390

ggt caa ctt gtt caa atc cgg tcc tac cac gcg tgt ctg caa tac aga   2271
Gly Gln Leu Val Gln Ile Arg Ser Tyr His Ala Cys Leu Gln Tyr Arg
395                 400                 405                 410

cta aca aaa gtg ctt taaaacgttc cggcttacgc cagacatcta gacgattgaa   2326
Leu Thr Lys Val Leu
            415

taatttcaat attgtctccg cacgtaattc aaaggctttg tgtatgtgcg aatgatattc 2386

acaacaaagt tctgcaaaat cttgaattgc gtgaggtaat ttaaagcgct gacataagcg 2446

tcttgtcggc atgacaccag ctttttcatg tccataatga tgtggcaata tttcttttgg 2506

tgttaaggct tttcctaaat catgacaaat tgcagcaaaa cgtaccgcac ttttgtcact 2566

gtccgtgttt tctgtcga                                              2584


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<212> PRT
<213> Pasteurella multocida

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Thr Ser Ser Asn Pro Phe Ala Tyr Lys His Tyr Asp Ala Asn Gln Val
             20                  25                  30

Ile Leu Gly Lys Thr Met Ala Glu His Leu Arg Leu Ala Val Cys Tyr
         35                  40                  45

Trp His Thr Phe Cys Trp Thr Gly Asn Asp Met Phe Gly Val Gly Ser
     50                  55                  60

Phe Asp Arg Cys Trp Gln Lys Ala Ser Asp Ser Leu Ala Gly Ala Lys
 65                  70                  75                  80

Gln Lys Ala Asp Ile Ala Phe Glu Phe Phe Ser Lys Leu Gly Ile Pro
                 85                  90                  95

Tyr Tyr Cys Phe His Asp Val Asp Val Ala Pro Glu Gly His Ser Phe
            100                 105                 110

Lys Glu Tyr Leu Ser Asn Phe Asn Thr Met Ile Asp Val Leu Ala Gln
        115                 120                 125
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Lys Gln Glu Glu Thr Gly Val Lys Leu Leu Trp Gly Thr Ala Asn Cys
    130                 135                 140

Phe Thr His Pro Arg Tyr Met Ser Gly Ala Ala Thr Asn Pro Asn Pro
145                 150                 155                 160

Glu Ile Phe Ala Trp Ala Ala Ala Gln Val Phe Thr Ala Met Gly Ala
                165                 170                 175

Thr Gln Arg Leu Gly Gly Glu Asn Tyr Val Leu Trp Gly Gly Arg Glu
            180                 185                 190

Gly Tyr Glu Thr Leu Leu Asn Thr Asn Leu Lys Gln Glu Arg Glu Gln
        195                 200                 205

Ile Gly Arg Phe Met Gln Met Val Val Glu His Lys Tyr Lys Ile Gly
    210                 215                 220

Phe Asn Gly Thr Leu Leu Ile Glu Pro Lys Pro Gln Glu Pro Thr Lys
225                 230                 235                 240

His Gln Tyr Asp Tyr Asp Val Ala Thr Val Tyr Gly Phe Leu Lys Gln
                245                 250                 255

Phe Gly Leu Glu Lys Glu Ile Lys Val Asn Ile Glu Ala Asn His Ala
            260                 265                 270

Thr Leu Ala Gly His Thr Phe Gln His Glu Val Ala Met Ala Thr Ala
        275                 280                 285

Leu Asp Ile Phe Gly Ser Ile Asp Ala Asn Arg Gly Asp Pro Gln Leu
    290                 295                 300

Gly Trp Asp Thr Asp Gln Phe Pro Asn Ser Val Glu Glu Asn Thr Leu
305                 310                 315                 320

Val Ile Tyr Glu Ile Leu Lys Ala Gly Gly Phe Thr Thr Gly Gly Phe
                325                 330                 335

Asn Phe Asp Ala Lys Ile Arg Arg Gln Ser Thr Asp Pro Tyr Asp Leu
            340                 345                 350

Phe His Gly His Ile Gly Ala Ile Asp Val Leu Ala Leu Ser Leu Lys
        355                 360                 365

Cys Ala Ala Lys Met Leu Glu Glu Gln Ala Leu Gln Lys Val Val Asn
    370                 375                 380

Gln Arg Tyr Ala Gly Trp Thr Ser Ser Leu Gly Gln Leu Val Gln Ile
385                 390                 395                 400

Arg Ser Tyr His Ala Cys Leu Gln Tyr Arg Leu Thr Lys Val Leu
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gtcaagaata atgtgatgtt accggtgatt aataccaata ttgaaccgca ctttgatgcc 180

cttagagcca cccaaatgaa cacgaaagtg ctcgatacct caaaagtgaa tgccgaacaa 240

gtcaaaaaat ggattgctgt ttggcaaacg accctaaccc aataattgtt tgtcttg 297

atg	ttt	aag	cga	ttt	cgt	gca	ttc	aca	tac	cgt	ccc	345
Met	Phe	Lys	Arg	Phe	Arg	Ala	Phe	Thr	Tyr	Arg	Pro	
1			5				10				15	

gcc	ggg	atg	ttg	gtg	att	gtt	ttt	ctg	agc	gct	ttt	393
Ala	Gly	Met	Leu	Val	Ile	Val	Phe	Leu	Ser	Ala	Phe	
		20					25				30	

tat	gcg	ttc	gcc	tta	ggg	gcg	gtt	ttt	tcg	ctc	cct	441
Tyr	Ala	Phe	Ala	Leu	Gly	Ala	Val	Phe	Ser	Leu	Pro	
				35				40				

ttt	gcg	cgc	agt	tgg	aca	gcg	ttg	ttg	agt	gat	cag	489
Phe	Ala	Arg	Ser	Trp	Thr	Ala	Leu	Leu	Ser	Asp	Gln	
				45				50				

tat	tta	caa	cac	gtg	atc	atc	ttt	agc	ttt	tgg	caa	537
Tyr	Leu	Gln	His	Val	Ile	Ile	Phe	Ser	Phe	Trp	Gln	
			55				60					

gcc	ttt	ctg	tcg	gcg	gta	ctt	gcg	gtc	ctc	ttt	ggt	585
Ala	Phe	Leu	Ser	Ala	Val	Leu	Ala	Val	Leu	Phe	Gly	
65				70				75				

ggc	att	gta	gca	cga	gcc	ttt	ttt	tat	caa	ccg	ttt	633
Gly	Ile	Val	Ala	Arg	Ala	Phe	Phe	Tyr	Gln	Pro	Phe	
			80				85					

gtg	ggc	aag	aaa	ctg	atc	ctc	aaa	tta	ttt	tca	ctg	681
Val	Gly	Lys	Lys	Leu	Ile	Leu	Lys	Leu	Phe	Ser	Leu	
		90					95					

act	ttt	gtg	tta	cct	gcc	tta	gtg	gcg	att	ttt	ggt	729
Thr	Phe	Val	Leu	Pro	Ala	Leu	Val	Ala	Ile	Phe	Gly	
		100				105				110		

tta	tta	ggc	gtg	tat	ggc	gct	tct	ggc	tgg	tta	gcg	777
Leu	Leu	Gly	Val	Tyr	Gly	Ala	Ser	Gly	Trp	Leu	Ala	
		115				120				125		

atg	tta	agc	cag	ttt	ttc	gct	tgg	gat	tgg	act	cct	825
Met	Leu	Ser	Gln	Phe	Phe	Ala	Trp	Asp	Trp	Thr	Pro	
				130				135				

aat	att	tac	ggc	tta	aca	ggt	att	tta	ctg	gcg	cat	873
Asn	Ile	Tyr	Gly	Leu	Thr	Gly	Ile	Leu	Leu	Ala	His	
			140					145				

ctt	ttt	ttt	aat	gtc	cca	tta	gct	tgt	cgc	ctg	ttt	921
Leu	Phe	Phe	Asn	Val	Pro	Leu	Ala	Cys	Arg	Leu	Phe	
			150				155				160	

tta	caa	ggt	ttg	caa	gca	att	ccg	gtg	caa	caa	cgt	969
Leu	Gln	Gly	Leu	Gln	Ala	Ile	Pro	Val	Gln	Gln	Arg	
				165				170				

cag	ctc	gcg	gca	caa	ctc	aat	tta	cgt	ggt	tgg	cat	1017
Gln	Leu	Ala	Ala	Gln	Leu	Asn	Leu	Arg	Gly	Trp	His	
			175					180				

ttt	ata	cgt	ctg	att	gag	tgg	ccc	caa	ctc	aat	tta	1065
Phe	Ile	Arg	Leu	Ile	Glu	Trp	Pro	Gln	Leu	Asn	Leu	
				185					190			

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tat tta cgc cag caa ttg tta cct gca ttt act ttg att ttc atg ctg   921
Tyr Leu Arg Gln Gln Leu Leu Pro Ala Phe Thr Leu Ile Phe Met Leu
        195                 200                 205

tgt ttt acc agt ttt gcg att gtg ctc act tta ggt ggc gga ccg aaa   969
Cys Phe Thr Ser Phe Ala Ile Val Leu Thr Leu Gly Gly Gly Pro Lys
    210                 215                 220

tat acc acg ttg gaa gtg gct atc tat caa gcg att tta ttt gag ttt   1017
Tyr Thr Thr Leu Glu Val Ala Ile Tyr Gln Ala Ile Leu Phe Glu Phe
225                 230                 235                 240

gat gta ccg aaa gcc ggc tta ttt gcg tta tta caa ttt gtt ttt tgt   1065
Asp Val Pro Lys Ala Gly Leu Phe Ala Leu Leu Gln Phe Val Phe Cys
                245                 250                 255


ttt ctg tta ttc acg ctg agt agc ttt ttt tct cca gcc ccc gcc acg   1113
Phe Leu Leu Phe Thr Leu Ser Ser Phe Phe Ser Pro Ala Pro Ala Thr
            260                 265                 270

aca tta cac agt caa cct act tgg ttt gcg ccc caa tcg tat tgg gtt   1161
Thr Leu His Ser Gln Pro Thr Trp Phe Ala Pro Gln Ser Tyr Trp Val
        275                 280                 285

aaa tta tgg caa cgt atg atc att gtg tgt gcg aca gta ttt atc tta   1209
Lys Leu Trp Gln Arg Met Ile Ile Val Cys Ala Thr Val Phe Ile Leu
    290                 295                 300

tta ccg cta ctc aat acg cta gtt tct gct ttg ctt tcg tct cag ttt   1257
Leu Pro Leu Leu Asn Thr Leu Val Ser Ala Leu Leu Ser Ser Gln Phe
305                 310                 315                 320

ttt acc ttg tgg tta caa cct caa tta tgg aaa gca tta ggt tac tcg   1305
Phe Thr Leu Trp Leu Gln Pro Gln Leu Trp Lys Ala Leu Gly Tyr Ser
                325                 330                 335

ctc acc atc gcc ccc act tct gca ttg ctc gct tta gta ctg tct ttt   1353
Leu Thr Ile Ala Pro Thr Ser Ala Leu Leu Ala Leu Val Leu Ser Phe
            340                 345                 350

gcc tta tta ttg ctt gcc aga gaa tta cat tgg cga cat tat cgc agc   1401
Ala Leu Leu Leu Leu Ala Arg Glu Leu His Trp Arg His Tyr Arg Ser
        355                 360                 365

tta tcc cat gtg att tta aat atc ggt gcg acc att tta gcc att cca   1449
Leu Ser His Val Ile Leu Asn Ile Gly Ala Thr Ile Leu Ala Ile Pro
    370                 375                 380

acg tta gtg tta gct att ggt tta ttc att tta tta cgt gag atc gat   1497
Thr Leu Val Leu Ala Ile Gly Leu Phe Ile Leu Leu Arg Glu Ile Asp
385                 390                 395                 400

ttt tct cca tac cat ctt ttt ggg gtt gtg gta tgc tgt aac gcg tta   1545
Phe Ser Pro Tyr His Leu Phe Gly Val Val Val Cys Cys Asn Ala Leu
                405                 410                 415

gct gct atg cct ttt gtg ttg cgt att ttg gct tta ccg atg cat aac   1593
Ala Ala Met Pro Phe Val Leu Arg Ile Leu Ala Leu Pro Met His Asn
            420                 425                 430

aat atg att tat tat gaa aaa tta tgc caa tca ctt aac ctg cgt ggt   1641
Asn Met Ile Tyr Tyr Glu Lys Leu Cys Gln Ser Leu Asn Leu Arg Gly
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        435                 440                 445

tgg caa cgt ttt cga ttg att gaa tgg cac aag ctt cgt gcg cca atg   1689
Trp Gln Arg Phe Arg Leu Ile Glu Trp His Lys Leu Arg Ala Pro Met
    450                 455                 460

aaa tac gcc ttt gca ctg gct tgt gcg tta tca tta ggc gat ttc acc   1737
Lys Tyr Ala Phe Ala Leu Ala Cys Ala Leu Ser Leu Gly Asp Phe Thr
465                 470                 475                 480

gca atc gcg tta ttt ggt cag gct gac ttc aca tcg tta ccg cat ttg   1785
Ala Ile Ala Leu Phe Gly Gln Ala Asp Phe Thr Ser Leu Pro His Leu
                485                 490                 495


ttg tat caa caa ttg ggg cat tat cgt agt cag gaa gcg gca gta aca   1833
Leu Tyr Gln Gln Leu Gly His Tyr Arg Ser Gln Glu Ala Ala Val Thr
            500                 505                 510

gcg ttt att tta ttg gtt ttt tgt ttg agt gtt ttt atg att att gaa   1881
Ala Phe Ile Leu Leu Val Phe Cys Leu Ser Val Phe Met Ile Ile Glu
        515                 520                 525

cga cat cag gaa ccg cgt gat gat taatttaaac ggtgttcagt tttcctataa  1935
Arg His Gln Glu Pro Arg Asp Asp
    530                 535

tacctttact tttgagctgg atttgcagat tcctgctcaa caaaaagttg ctattattgg 1995

cgccagtggc gcagggaaga gtaccttatt aaatttgatt gcgggttttg cattgccaca 2055

gcaaggggaa atttggttga atggtgaaaa tcatagccaa actcaacctt atgaacgtcc 2115

ggtatctatt ttgtttcaag aaaacaactt gtttacgcat ttgactgtgg cagagaatat 2175

ggcattaggg ctgaaaccaa gcctaaaact gaccgcactt gaacaacaac gcgtacaaca 2235

agtggcaagt gcagtgggtt tgcagggttt tcttaatcaa ttacccaccc agttatcggg 2295

tgggcaaaaa cagcgtgtgg cgttggcgcg ttgtttatta cgcgataagc caattttgtt 2355

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attacagcag aaaatggatc gtatgattcg ttttgaacat ggtaggatga gtgagtccac 2535

cattttgaag gataatttta acgaaaaaca gaccgcactt taggcggctt attaattaga 2595

taaggaaaga gaaaaatatg acaacggcaa cggcatttga gattcgtaca cttactcctc 2655

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catggcgtgg accgaaaccg aaagacattg aaaaagttac cgcaatcatt aaagcggtga 3015
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aagaactggg cttagaaacc tgtggtacct ttggtttatt gcaagatggg atggcagaag 3075

atttaaaaga agcgggtttg gattattata accataatct cgatacagcc ccagaacact 3135

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gtaaagctgg cttaaaagtg tgctgtggcg ggattattgg catgaatgaa acccgtaaag 3255

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cagaatttgt gcgcactatt gcggtggcgc gtattaccat gccgaaaagc tatgtacgtt 3435

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			20					25					30		
Leu	Gly	Ala	Val	Phe	Ser	Leu	Pro	Phe	Ala	Arg	Ser	Trp	Thr	Ala	Leu
		35					40					45			
Leu	Ser	Asp	Gln	Tyr	Leu	Gln	His	Val	Ile	Ile	Phe	Ser	Phe	Trp	Gln
	50					55					60				
Ala	Phe	Leu	Ser	Ala	Val	Leu	Ala	Val	Leu	Phe	Gly	Gly	Ile	Val	Ala
65					70					75					80
Arg	Ala	Phe	Phe	Tyr	Gln	Pro	Phe	Val	Gly	Lys	Lys	Leu	Ile	Leu	Lys
				85					90					95	
Leu	Phe	Ser	Leu	Thr	Phe	Val	Leu	Pro	Ala	Leu	Val	Ala	Ile	Phe	Gly
			100					105					110		
Leu	Leu	Gly	Val	Tyr	Gly	Ala	Ser	Gly	Trp	Leu	Ala	Met	Leu	Ser	Gln
		115					120					125			
Phe	Phe	Ala	Trp	Asp	Trp	Thr	Pro	Asn	Ile	Tyr	Gly	Leu	Thr	Gly	Ile
	130					135					140				
Leu	Leu	Ala	His	Leu	Phe	Phe	Asn	Val	Pro	Leu	Ala	Cys	Arg	Leu	Phe
145					150					155					160
Leu	Gln	Gly	Leu	Gln	Ala	Ile	Pro	Val	Gln	Gln	Arg	Gln	Leu	Ala	Ala
				165					170					175	
Gln	Leu	Asn	Leu	Arg	Gly	Trp	His	Phe	Ile	Arg	Leu	Ile	Glu	Trp	Pro
			180					185					190		
Tyr	Leu	Arg	Gln	Gln	Leu	Leu	Pro	Ala	Phe	Thr	Leu	Ile	Phe	Met	Leu
		195					200					205			

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Cys Phe Thr Ser Phe Ala Ile Val Leu Thr Leu Gly Gly Gly Pro Lys
    210                 215                 220

Tyr Thr Thr Leu Glu Val Ala Ile Tyr Gln Ala Ile Leu Phe Glu Phe
225                 230                 235                 240

Asp Val Pro Lys Ala Gly Leu Phe Ala Leu Leu Gln Phe Val Phe Cys
                245                 250                 255

Phe Leu Leu Phe Thr Leu Ser Ser Phe Phe Ser Pro Ala Pro Ala Thr
            260                 265                 270

Thr Leu His Ser Gln Pro Thr Trp Phe Ala Pro Gln Ser Tyr Trp Val
        275                 280                 285

Lys Leu Trp Gln Arg Met Ile Ile Val Cys Ala Thr Val Phe Ile Leu
    290                 295                 300

Leu Pro Leu Leu Asn Thr Leu Val Ser Ala Leu Leu Ser Ser Gln Phe
305                 310                 315                 320

Phe Thr Leu Trp Leu Gln Pro Gln Leu Trp Lys Ala Leu Gly Tyr Ser
                325                 330                 335

Leu Thr Ile Ala Pro Thr Ser Ala Leu Leu Ala Leu Val Leu Ser Phe
            340                 345                 350

Ala Leu Leu Leu Leu Ala Arg Glu Leu His Trp Arg His Tyr Arg Ser
        355                 360                 365

Leu Ser His Val Ile Leu Asn Ile Gly Ala Thr Ile Leu Ala Ile Pro
    370                 375                 380

Thr Leu Val Leu Ala Ile Gly Leu Phe Ile Leu Leu Arg Glu Ile Asp
385                 390                 395                 400

Phe Ser Pro Tyr His Leu Phe Gly Val Val Val Cys Cys Asn Ala Leu
                405                 410                 415

Ala Ala Met Pro Phe Val Leu Arg Ile Leu Ala Leu Pro Met His Asn
            420                 425                 430

Asn Met Ile Tyr Tyr Glu Lys Leu Cys Gln Ser Leu Asn Leu Arg Gly
        435                 440                 445

Trp Gln Arg Phe Arg Leu Ile Glu Trp His Lys Leu Arg Ala Pro Met
    450                 455                 460

Lys Tyr Ala Phe Ala Leu Ala Cys Ala Leu Ser Leu Gly Asp Phe Thr
465                 470                 475                 480

Ala Ile Ala Leu Phe Gly Gln Ala Asp Phe Thr Ser Leu Pro His Leu
                485                 490                 495

Leu Tyr Gln Gln Leu Gly His Tyr Arg Ser Gln Glu Ala Ala Val Thr
            500                 505                 510

Ala Phe Ile Leu Leu Val Phe Cys Leu Ser Val Phe Met Ile Ile Glu
        515                 520                 525

Arg His Gln Glu Pro Arg Asp Asp
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tgcaggagaa aaagtttatg aaatccaaaa agaatggact gacaatattg aaaaagcttc 180

caatgggaga ataagtatag agttattacc tctcgactca gtcttaaaat ctagtgacat 240

gctttctggt gttcgaaata aaattattga tggagcggtt gcaacagcgg caatgtatgc 300

aggcactgac cctggattcg gattaattgg tgatactatt tctgcttgga accatgacga 360

agatatttta aatttttact ataatggagg tggttttgaa gttgttgata atattttcca 420

acaatatggt gccaaactca ttggtgtatc anttacggga gcagaatcat taccatcgaa 480

agtaaaaata gctaatactg aagattttaa aggtataaaa attcgggctc cctctggtcc 540

tatccaaaaa ttgtttgcaa gattaggagc cgctcctgtt ggtcttcctg gttcagaaat 600

ctatactagt ttagaaaaag gtattattga tgctgccgat ttctcaacgt ttgcaaataa 660

tcaagcacaa ggagtccatg atattgcaaa atatccaatc tatccgggaa ttcattcttc 720

accagccgtt catatgatta tgaatcataa aacttggagt agcttaactc catcggatca 780

agcattctta attgcttact ttaaagggat ggctctcgat actctgactc gtgctcatta 840

tgaagataaa ctagcatata aagaagcact tgagaaagga gtacaaccag tttcttggaa 900

tcaacaagaa attacaaaag ttcgttctat cgctaaagaa atttggcaag agatagctca 960

acaatctgaa ataggtaatc aagtattatc aagtattaat gaaattccta gaatctcaag 1020

gaatgctgca ataatcgtca agatggataa gacgatatcg tcttatccat taaggagtaa 1080

aacatgctta tttctaaata tttattatgg ctctgtaata agctagatca aatattcatt 1140

aaagtaggtt attacgtttc ttatattttt ctattagttg ttatcattgg ttttacgagg 1200

ttgttgctcg gtatttattc tctagcccaa cactttgggt tcatgaagta acaacatttt 1260

taataagtct atcattactt tatggtggag tagcttgtta cgccagtaat aaacatattg 1320

ccatgacatt tattagacaa aaattaccta ataagatcaa atggttacta gaactcttag 1380

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ttgaaatact tatttttatc ttctttattt tgcttagtta cggagcatac ttatcagcta 1440

gagaagcatt atttactcca tcaggaaaat tcaaaatgca aacttctgga agtgtattag 1500


acatgccatt tccagcaatt gaaaaaagtt tcttctttat ttc atg cct cat cat   1555
                                                Met Pro His His
                                                  1

tgt tgt tct ttc agt act aca tat att ccg tca cat cta tac aaa ata   1603
Cys Cys Ser Phe Ser Thr Thr Tyr Ile Pro Ser His Leu Tyr Lys Ile
  5                  10                  15                  20

tca gga gga att atc atg ata agt gca ttt ggg ata ggt att gga act   1651
Ser Gly Gly Ile Ile Met Ile Ser Ala Phe Gly Ile Gly Ile Gly Thr
                 25                  30                  35

ctt att atc ttt tta atg atg att tcc ctt tta ttt att gga atg cca   1699
Leu Ile Ile Phe Leu Met Met Ile Ser Leu Leu Phe Ile Gly Met Pro
             40                  45                  50

tta ggt ttt ctc act ggg tta atc gct tta gtt att tca tat ctt tgg   1747
Leu Gly Phe Leu Thr Gly Leu Ile Ala Leu Val Ile Ser Tyr Leu Trp
         55                  60                  65

ttt gat act acc gca ata atg caa atg ata gct tca cgt gtc act gat   1795
Phe Asp Thr Thr Ala Ile Met Gln Met Ile Ala Ser Arg Val Thr Asp
     70                  75                  80

ttc aca tca tct tac act ttt gta gct gtg cct atg ttt gtt ctt atg   1843
Phe Thr Ser Ser Tyr Thr Phe Val Ala Val Pro Met Phe Val Leu Met
 85                  90                  95                 100

gca aca tta ctt gat aag act gga att gct aga gat ctc tac aac gca   1891
Ala Thr Leu Leu Asp Lys Thr Gly Ile Ala Arg Asp Leu Tyr Asn Ala
                105                 110                 115

atg cga gtc att ggc ggt cga tta cga ggt gga att gca att caa tcg   1939
Met Arg Val Ile Gly Gly Arg Leu Arg Gly Gly Ile Ala Ile Gln Ser
            120                 125                 130

atg ttt gtt gca gtt cta ctt gct acg atg tca ggt att atc ggt gga   1987
Met Phe Val Ala Val Leu Leu Ala Thr Met Ser Gly Ile Ile Gly Gly
        135                 140                 145

gaa act gtt tta tta ggc atg ttg gca tta cca caa atg tta cgc tta   2035
Glu Thr Val Leu Leu Gly Met Leu Ala Leu Pro Gln Met Leu Arg Leu
    150                 155                 160

ggc tat aat aaa aac tta gct ata gga act gtt gta gca gga gga gca   2083
Gly Tyr Asn Lys Asn Leu Ala Ile Gly Thr Val Val Ala Gly Gly Ala
165                 170                 175                 180

ttg ggt aca atg gtt cct cca agt atc gtg ttg att att tac gga atg   2131
Leu Gly Thr Met Val Pro Pro Ser Ile Val Leu Ile Ile Tyr Gly Met
                185                 190                 195

acc gca aat gtt tct att gga gaa cta ttt ctt gca gca att cca gcc   2179
Thr Ala Asn Val Ser Ile Gly Glu Leu Phe Leu Ala Ala Ile Pro Ala
            200                 205                 210

tcc tta cta ctt tct aca ttc tat att tta tat att cta gta ctt tgc   2227
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Ser Leu Leu Leu Ser Thr Phe Tyr Ile Leu Tyr Ile Leu Val Leu Cys
        215                 220                 225

tac ttc aaa cct agc tat ggc cct gca atg cct agc tca gaa aat cat   2275
Tyr Phe Lys Pro Ser Tyr Gly Pro Ala Met Pro Ser Ser Glu Asn His
    230                 235                 240

aca tta acg aaa gaa gat att aaa aaa att att cat gat att gca att   2323
Thr Leu Thr Lys Glu Asp Ile Lys Lys Ile Ile His Asp Ile Ala Ile
245                 250                 255                 260

cca gta gct atc gcc aca tgg att tta gga agt att tat ggc ggg ata   2371
Pro Val Ala Ile Ala Thr Trp Ile Leu Gly Ser Ile Tyr Gly Gly Ile
                265                 270                 275

gca tca atc act gaa tct gcc tgt gtt ggt gta gtt ggg gta ata tta   2419
Ala Ser Ile Thr Glu Ser Ala Cys Val Gly Val Val Gly Val Ile Leu
            280                 285                 290

gca gca ttc tat cga aaa gaa tta aat ttc aaa ata gta caa gaa tca   2467
Ala Ala Phe Tyr Arg Lys Glu Leu Asn Phe Lys Ile Val Gln Glu Ser
        295                 300                 305

cta aaa cat aca atc aat act gtt ggt atg ata atc tgg gtc ggc att   2515
Leu Lys His Thr Ile Asn Thr Val Gly Met Ile Ile Trp Val Gly Ile
    310                 315                 320

ggc gca aca atg att ata ggt att tat aat cta atg ggt ggg gac cga   2563
Gly Ala Thr Met Ile Ile Gly Ile Tyr Asn Leu Met Gly Gly Asp Arg
325                 330                 335                 340

ttt ata gct aac tta ttc gct agc tta gat gcc tct cca att tat act   2611
Phe Ile Ala Asn Leu Phe Ala Ser Leu Asp Ala Ser Pro Ile Tyr Thr
                345                 350                 355

atc att att atg atg gtt att tta tta ata ctt ggt atg ttc tta gat   2659
Ile Ile Ile Met Met Val Ile Leu Leu Ile Leu Gly Met Phe Leu Asp
            360                 365                 370

tgg att ggt gtt gcc atg ttg act ttc ctc aag aca agt aaa gcg aca   2707
Trp Ile Gly Val Ala Met Leu Thr Phe Leu Lys Thr Ser Lys Ala Thr
        375                 380                 385

atc aat ttg tgt ttt gac ata gtc agg tac agt att tgg cgt ggt ccc   2755
Ile Asn Leu Cys Phe Asp Ile Val Arg Tyr Ser Ile Trp Arg Gly Pro
    390                 395                 400

tcc ttc cac agt acc aat gtt cat cgt ggt acc ttt gtc ggg cgc ggt   2803
Ser Phe His Ser Thr Asn Val His Arg Gly Thr Phe Val Gly Arg Gly
405                 410                 415                 420

act ttt tagtaaatct tgcgcgatac gaataaacgc attgatggca tttgctccgt    2859
Thr Phe

tttgtggatc gactgccgca tgagcagatt tgccaaaaaa ttcaattaca tacttcccaa 2919

tccctttttct ttcgttaacg tttccactta gattgcccag aagccgatct gtctgaatgg 2979

gaacaagtgt tataccaaga agcgaatcca acaggtgaag tggtgatcgg tatggtgggt 3039

aaatacactg aattaccgga tgcctacaaa tcggttaatg aagccttgaa acacgcaggc 3099
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ttaaaaaacc gtcttagcgt gcaaatcaaa tatattgatt cacaagatgt ggaaaccaaa 3159

ggcacagaag tgttagaagg cgt 3182

<210> 73
<211> 422
<212> PRT
<213> Pasteurella multocida

<400> 73

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Met Pro His His Cys Cys Ser Phe Ser Thr Thr Tyr Ile Pro Ser His
  1               5                  10                  15

Leu Tyr Lys Ile Ser Gly Gly Ile Ile Met Ile Ser Ala Phe Gly Ile
             20                  25                  30

Gly Ile Gly Thr Leu Ile Ile Phe Leu Met Met Ile Ser Leu Leu Phe
         35                  40                  45

Ile Gly Met Pro Leu Gly Phe Leu Thr Gly Leu Ile Ala Leu Val Ile
     50                  55                  60

Ser Tyr Leu Trp Phe Asp Thr Thr Ala Ile Met Gln Met Ile Ala Ser
 65                  70                  75                  80

Arg Val Thr Asp Phe Thr Ser Ser Tyr Thr Phe Val Ala Val Pro Met
                 85                  90                  95

Phe Val Leu Met Ala Thr Leu Leu Asp Lys Thr Gly Ile Ala Arg Asp
            100                 105                 110

Leu Tyr Asn Ala Met Arg Val Ile Gly Gly Arg Leu Arg Gly Gly Ile
        115                 120                 125

Ala Ile Gln Ser Met Phe Val Ala Val Leu Leu Ala Thr Met Ser Gly
    130                 135                 140

Ile Ile Gly Gly Glu Thr Val Leu Leu Gly Met Leu Ala Leu Pro Gln
145                 150                 155                 160

Met Leu Arg Leu Gly Tyr Asn Lys Asn Leu Ala Ile Gly Thr Val Val
                165                 170                 175

Ala Gly Gly Ala Leu Gly Thr Met Val Pro Pro Ser Ile Val Leu Ile
            180                 185                 190

Ile Tyr Gly Met Thr Ala Asn Val Ser Ile Gly Glu Leu Phe Leu Ala
        195                 200                 205

Ala Ile Pro Ala Ser Leu Leu Leu Ser Thr Phe Tyr Ile Leu Tyr Ile
    210                 215                 220

Leu Val Leu Cys Tyr Phe Lys Pro Ser Tyr Gly Pro Ala Met Pro Ser
225                 230                 235                 240

Ser Glu Asn His Thr Leu Thr Lys Glu Asp Ile Lys Lys Ile Ile His
                245                 250                 255

Asp Ile Ala Ile Pro Val Ala Ile Ala Thr Trp Ile Leu Gly Ser Ile
            260                 265                 270
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```
Tyr Gly Gly Ile Ala Ser Ile Thr Glu Ser Ala Cys Val Gly Val Val
        275                 280                 285

Gly Val Ile Leu Ala Ala Phe Tyr Arg Lys Glu Leu Asn Phe Lys Ile
    290                 295                 300

Val Gln Glu Ser Leu Lys His Thr Ile Asn Thr Val Gly Met Ile Ile
305                 310                 315                 320

Trp Val Gly Ile Gly Ala Thr Met Ile Ile Gly Ile Tyr Asn Leu Met
                325                 330                 335

Gly Gly Asp Arg Phe Ile Ala Asn Leu Phe Ala Ser Leu Asp Ala Ser
            340                 345                 350

Pro Ile Tyr Thr Ile Ile Ile Met Met Val Ile Leu Leu Ile Leu Gly
        355                 360                 365

Met Phe Leu Asp Trp Ile Gly Val Ala Met Leu Thr Phe Leu Lys Thr
    370                 375                 380

Ser Lys Ala Thr Ile Asn Leu Cys Phe Asp Ile Val Arg Tyr Ser Ile
385                 390                 395                 400

Trp Arg Gly Pro Ser Phe His Ser Thr Asn Val His Arg Gly Thr Phe
                405                 410                 415

Val Gly Arg Gly Thr Phe
            420
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<210> 74
<211> 2787
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (463)..(936)

<220>
<223> yhcJ

<400> 74
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gcatacaaag caagaatgtt ggccagtgtg tcatgcatcg cattggcagc atcagcttgt 120

ggcgttgcaa tctgttggcg ttgttctatt ttgccgtctg ttacaatagc cgaggcaatt 180

tttgttccac caatatctaa tgctaaacag cgcataggct ctccttctgt gatgacttat 240

tttgccgatt tgacggcatc ggcaaaccag cttacgatat gttcgaggcg agtcagcgca 300

gatcctacgg tgacagagta agcaccaatc tcaattgcgg ttttcgccaa ttctggggtg 360

ttatagcgcc cttctgccat cactcggcag ccagcagcat tcaaatcttt gactaactga 420

taatccggtt cagctggaat ttcaccgcca gtataaccag ac atg gtg cta cca 474
                                                Met Val Leu Pro
                                                  1

ata att tct acc cct aag ttg tgg caa tac atc cct tct tca aaa tta 522

```
Ile Ile Ser Thr Pro Lys Leu Trp Gln Tyr Ile Pro Ser Ser Lys Leu
  5                  10                  15                  20

gaa caa tcc gcc atg gct aaa caa cct aat tct ttg att cgt tta ata   570
Glu Gln Ser Ala Met Ala Lys Gln Pro Asn Ser Leu Ile Arg Leu Ile
                 25                  30                  35

atg gct tca cgt gta gtt gga cgg acg cga tcg gta cca tca aaa gca   618
Met Ala Ser Arg Val Val Gly Arg Thr Arg Ser Val Pro Ser Lys Ala
             40                  45                  50

ata ata tcg gcg cct gct gcg gct aac tct tca atg tct tgt aaa aat   666
Ile Ile Ser Ala Pro Ala Ala Ala Asn Ser Ser Met Ser Cys Lys Asn
         55                  60                  65

ggg cta ata cga acg gga ctg tca ggt aaa tcg cgt tta acg ata cca   714
Gly Leu Ile Arg Thr Gly Leu Ser Gly Lys Ser Arg Leu Thr Ile Pro
     70                  75                  80

ata atc ggt aca ttg acg acg tta cgc gtg gct ttt aaa ttt tcg atc   762
Ile Ile Gly Thr Leu Thr Thr Leu Arg Val Ala Phe Lys Phe Ser Ile
 85                  90                  95                 100

cct tca ata cgt aac ccg gca gca cca ccg ata acg gat gct tgc gcc   810
Pro Ser Ile Arg Asn Pro Ala Ala Pro Pro Ile Thr Asp Ala Cys Ala
                105                 110                 115

atg gcg gca aca att tct ggc gag tcc att ggc cca tta tct acg ggc   858
Met Ala Ala Thr Ile Ser Gly Glu Ser Ile Gly Pro Leu Ser Thr Gly
            120                 125                 130

tgg caa gat gcg att aag cca tat tta att tgt tct aaa act tgc gga   906
Trp Gln Asp Ala Ile Lys Pro Tyr Leu Ile Cys Ser Lys Thr Cys Gly
        135                 140                 145

tgt gat agt ttt gac ata tta act cca gtc taaatttatc aaaagaagat     956
Cys Asp Ser Phe Asp Ile Leu Thr Pro Val
    150                 155

tgactccaat ttgcataggt taatcttaga attaaaaaat aacaaccaaa ataataaaaa 1016

tttgagatct ttgtcgcata tttattcata gggaatagac agcttaattt tagttatgat 1076

ttgtcaatcc ttgctatttt ttgtgtttgc tggtttgcga tacactgttc taatattgct 1136

ttgagcactt gataaccttg ctcattaaaa tgtaatccgt cggtacaaag gcgtaaatcc 1196

agttcaccgt tagaatcaca aaagtatttt tgtgtttcaa cgtaagtcac gtctgacgga 1256

caatgttgtt ttaaataggt attgagcctg tgaatttgtg cgttagtgac cgtattaatc 1316

tgattgaccg gtgtggcttc taataaaaag tagtgggacg taggagaaat ggtgtgtagg 1376

tgagtcagaa tgtcatttaa ctatcgcatg acttgcgccg gtgaatacgt ttcttcctta 1436

caaatatcat tgacgcctaa aaaaagaaaa acagattgtc caagttgttg aatccgttta 1496

ggtttaacga taacatccaa atattgtcgc gtactgacgc cagaaagtcc taaattggcg 1556

acggtttgtc ccgctaattg aggtgtgcct gctacctgtt cgtcccacat gtcaaaaagt 1616

gaatgaccaa ttaagctgat attggcaggt ttggaaaatt ccgccatttt gctctgatag 1676
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cgttgataaa tatcctgatc acttagcatg tgtggacctc tattttgaaa taaaacgcta 1736

agtattatat aaaacctgat atgccggtaa acagtaaact tatcttccgt aggggtaaat 1796

attcaatttt gtgacgaacc tatcatttat gaaataaaac ttcattttct atataaaaaa 1856

tagtttttc actttagaat gccaaacgtg tgaaatttat ttcatcatca ttttaacgta 1916

atcccaacgt aaccaataga ggagaactca taatgaaatt taaaaaacta ctacttgcat 1976

ctttatgttt aggtgtttca gcttctgtat ttgcagcaga ttacgatctt aaattcggta 2036

tggttgcggg tccaagctca aacgaatata aagcagtaga attctttgcg aaagaagtga 2096

aagaaaaatc caatggcaaa attgatgtgg ctattttccc tagctcacag ttaggtgatg 2156

accgtgtgat gattaaacaa ttaaaagacg gtgcattaga ctttacgtta ggtgaatcag 2216

cacgtttcca aatttacttc ccagaagcag aagtatttgc gttgccttat atgattccta 2276

attttgaaac ctctaaaaaa gcgttgctcg acacaaaatt tggtcaaggt ttattgaaaa 2336

aaattgataa agagttaaac gtacaagtgt tatctgtggc gtataacggt acacgtcaaa 2396

caacttctaa ccgtgcaatc aacagcattg aagacatgaa agggttaaaa ttacgtgtac 2456

ctaacgcggc aaccaacctt gcttatgcaa aatacgtggg tgcagcgcca acaccaatgg 2516

cattctctga agtttacctt gcgcttcaaa caaactctgt ggatggtcaa gaaaacccat 2576

taccgacaat ccaagcacaa aaattctatg aagtacaaaa atacttagcg ttaactaacc 2636

acatcttaaa tgaccaactt tacttaatca gtaacgatac gttggcagat ttaccagaag 2696

atttacaaaa agtggttaaa gatgcagcag cgaaagccgc tgaatatcac actaaactct 2756

tcgttgacgg tgagaacagc ttagttgaat t                                2787
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<210> 75
<211> 158
<212> PRT
<213> Pasteurella multocida

<400> 75

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Met Val Leu Pro Ile Ile Ser Thr Pro Lys Leu Trp Gln Tyr Ile Pro
  1               5                  10                  15

Ser Ser Lys Leu Glu Gln Ser Ala Met Ala Lys Gln Pro Asn Ser Leu
            20                  25                  30

Ile Arg Leu Ile Met Ala Ser Arg Val Val Gly Arg Thr Arg Ser Val
        35                  40                  45

Pro Ser Lys Ala Ile Ile Ser Ala Pro Ala Ala Ala Asn Ser Ser Met
    50                  55                  60

Ser Cys Lys Asn Gly Leu Ile Arg Thr Gly Leu Ser Gly Lys Ser Arg
65                  70                  75                  80

Leu Thr Ile Pro Ile Ile Gly Thr Leu Thr Thr Leu Arg Val Ala Phe
                85                  90                  95
```

Lys Phe Ser Ile Pro Ser Ile Arg Asn Pro Ala Ala Pro Pro Ile Thr
100 105 110

Asp Ala Cys Ala Met Ala Ala Thr Ile Ser Gly Glu Ser Ile Gly Pro
115 120 125

Leu Ser Thr Gly Trp Gln Asp Ala Ile Lys Pro Tyr Leu Ile Cys Ser
130 135 140

Lys Thr Cys Gly Cys Asp Ser Phe Asp Ile Leu Thr Pro Val
145 150 155

<210> 76
<211> 2787
<212> DNA
<213> Pasteurella multocida

<220>
<221> CDS
<222> (1949)..(2785)

<220>
<223> yiaO

<400> 76
gttaacacac catgattaat gatgccggtt gaagccactg caacgtaatc gaattgtccg 60

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ggcgttgcaa tctgttggcg ttgttctatt ttgccgtctg ttacaatagc cgaggcaatt 180

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gatcctacgg tgacagagta agcaccaatc tcaattgcgg ttttcgccaa ttctggggtg 360

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taatccggtt cagctggaat ttcaccgcca gtataaccag acatggtgct accaataatt 480

tctaccccta agttgtggca atacatccct tcttcaaaat tagaacaatc cgccatggct 540

aaacaaccta attctttgat tcgtttaata atggcttcac gtgtagttgg acggacgcga 600

tcggtaccat caaaagcaat aatatcggcg cctgctgcgg ctaactcttc aatgtcttgt 660

aaaaatgggc taatacgaac gggactgtca ggtaaatcgc gtttaacgat accaataatc 720

ggtacattga cgacgttacg cgtggctttt aaattttcga tcccttcaat acgtaacccg 780

gcagcaccac cgataacgga tgcttgcgcc atggcggcaa caatttctgg cgagtccatt 840

ggcccattat ctacgggctg gcaagatgcg attaagccat atttaatttg ttctaaaact 900

tgcggatgtg atagttttga catattaact ccagtctaaa tttatcaaaa gaagattgac 960

tccaatttgc ataggttaat cttagaatta aaaaataaca accaaaataa taaaaatttg 1020

agatctttgt cgcatattta ttcataggga atagacagct taattttagt tatgatttgt 1080

caatccttgc tatttttttgt gtttgctggt ttgcgataca ctgttctaat attgctttga 1140

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gcacttgata accttgctca ttaaaatgta atccgtcggt acaaaggcgt aaatccagtt 1200

caccgttaga atcacaaaag tatttttgtg tttcaacgta agtcacgtct gacggacaat 1260

gttgttttaa ataggtattg agcctgtgaa tttgtgcgtt agtgaccgta ttaatctgat 1320

tgaccggtgt ggcttctaat aaaaagtagt gggacgtagg agaaatggtg tgtaggtgag 1380

tcagaatgtc atttaactat cgcatgactt gcgccggtga atacgtttct tccttacaaa 1440

tatcattgac gcctaaaaaa agaaaaacag attgtccaag ttgttgaatc cgtttaggtt 1500

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gaccaattaa gctgatattg gcaggtttgg aaaattccgc cattttgctc tgatagcgtt 1680

gataaatatc ctgatcactt agcatgtgtg gacctctatt ttgaaataaa acgctaagta 1740

ttatataaaa cctgatatgc cggtaaacag taaacttatc ttccgtaggg gtaaatattc 1800

aattttgtga cgaacctatc atttatgaaa taaaacttca ttttctatat aaaaaatagt 1860

tttttcactt tagaatgcca aacgtgtgaa atttatttca tcatcatttt aacgtaatcc 1920

caacgtaacc aatagaggag aactcata atg aaa ttt aaa aaa cta cta ctt    1972
                              Met Lys Phe Lys Lys Leu Leu Leu
                                1               5

gca tct tta tgt tta ggt gtt tca gct tct gta ttt gca gca gat tac   2020
Ala Ser Leu Cys Leu Gly Val Ser Ala Ser Val Phe Ala Ala Asp Tyr
     10                  15                  20

gat ctt aaa ttc ggt atg gtt gcg ggt cca agc tca aac gaa tat aaa   2068
Asp Leu Lys Phe Gly Met Val Ala Gly Pro Ser Ser Asn Glu Tyr Lys
 25                  30                  35                  40

gca gta gaa ttc ttt gcg aaa gaa gtg aaa gaa aaa tcc aat ggc aaa   2116
Ala Val Glu Phe Phe Ala Lys Glu Val Lys Glu Lys Ser Asn Gly Lys
                 45                  50                  55

att gat gtg gct att ttc cct agc tca cag tta ggt gat gac cgt gtg   2164
Ile Asp Val Ala Ile Phe Pro Ser Ser Gln Leu Gly Asp Asp Arg Val
             60                  65                  70

atg att aaa caa tta aaa gac ggt gca tta gac ttt acg tta ggt gaa   2212
Met Ile Lys Gln Leu Lys Asp Gly Ala Leu Asp Phe Thr Leu Gly Glu
         75                  80                  85

tca gca cgt ttc caa att tac ttc cca gaa gca gaa gta ttt gcg ttg   2260
Ser Ala Arg Phe Gln Ile Tyr Phe Pro Glu Ala Glu Val Phe Ala Leu
     90                  95                  100


cct tat atg att cct aat ttt gaa acc tct aaa aaa gcg ttg ctc gac   2308
Pro Tyr Met Ile Pro Asn Phe Glu Thr Ser Lys Lys Ala Leu Leu Asp
105                 110                 115                 120

aca aaa ttt ggt caa ggt tta ttg aaa aaa att gat aaa gag tta aac   2356
Thr Lys Phe Gly Gln Gly Leu Leu Lys Lys Ile Asp Lys Glu Leu Asn
                125                 130                 135
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gta caa gtg tta tct gtg gcg tat aac ggt aca cgt caa aca act tct   2404
Val Gln Val Leu Ser Val Ala Tyr Asn Gly Thr Arg Gln Thr Thr Ser
            140                 145                 150

aac cgt gca atc aac agc att gaa gac atg aaa ggg tta aaa tta cgt   2452
Asn Arg Ala Ile Asn Ser Ile Glu Asp Met Lys Gly Leu Lys Leu Arg
        155                 160                 165

gta cct aac gcg gca acc aac ctt gct tat gca aaa tac gtg ggt gca   2500
Val Pro Asn Ala Ala Thr Asn Leu Ala Tyr Ala Lys Tyr Val Gly Ala
    170                 175                 180

gcg cca aca cca atg gca ttc tct gaa gtt tac ctt gcg ctt caa aca   2548
Ala Pro Thr Pro Met Ala Phe Ser Glu Val Tyr Leu Ala Leu Gln Thr
185                 190                 195                 200

aac tct gtg gat ggt caa gaa aac cca tta ccg aca atc caa gca caa   2596
Asn Ser Val Asp Gly Gln Glu Asn Pro Leu Pro Thr Ile Gln Ala Gln
                205                 210                 215

aaa ttc tat gaa gta caa aaa tac tta gcg tta act aac cac atc tta   2644
Lys Phe Tyr Glu Val Gln Lys Tyr Leu Ala Leu Thr Asn His Ile Leu
            220                 225                 230

aat gac caa ctt tac tta atc agt aac gat acg ttg gca gat tta cca   2692
Asn Asp Gln Leu Tyr Leu Ile Ser Asn Asp Thr Leu Ala Asp Leu Pro
        235                 240                 245

gaa gat tta caa aaa gtg gtt aaa gat gca gca gcg aaa gcc gct gaa   2740
Glu Asp Leu Gln Lys Val Val Lys Asp Ala Ala Ala Lys Ala Ala Glu
    250                 255                 260

tat cac act aaa ctc ttc gtt gac ggt gag aac agc tta gtt gaa tt    2787
Tyr His Thr Lys Leu Phe Val Asp Gly Glu Asn Ser Leu Val Glu
265                 270                 275
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<210> 77
<211> 279
<212> PRT
<213> Pasteurella multocida

<400> 77

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Met Lys Phe Lys Lys Leu Leu Leu Ala Ser Leu Cys Leu Gly Val Ser
  1               5                  10                  15

Ala Ser Val Phe Ala Ala Asp Tyr Asp Leu Lys Phe Gly Met Val Ala
            20                  25                  30

Gly Pro Ser Ser Asn Glu Tyr Lys Ala Val Glu Phe Phe Ala Lys Glu
        35                  40                  45

Val Lys Glu Lys Ser Asn Gly Lys Ile Asp Val Ala Ile Phe Pro Ser
    50                  55                  60

Ser Gln Leu Gly Asp Asp Arg Val Met Ile Lys Gln Leu Lys Asp Gly
65                  70                  75                  80

Ala Leu Asp Phe Thr Leu Gly Glu Ser Ala Arg Phe Gln Ile Tyr Phe
                85                  90                  95

Pro Glu Ala Glu Val Phe Ala Leu Pro Tyr Met Ile Pro Asn Phe Glu
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Thr Ser Lys Lys Ala Leu Leu Asp Thr Lys Phe Gly Gln Gly Leu Leu
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Lys Lys Ile Asp Lys Glu Leu Asn Val Gln Val Leu Ser Val Ala Tyr
    130                 135                 140

Asn Gly Thr Arg Gln Thr Thr Ser Asn Arg Ala Ile Asn Ser Ile Glu
145                 150                 155                 160

Asp Met Lys Gly Leu Lys Leu Arg Val Pro Asn Ala Ala Thr Asn Leu
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Ala Tyr Ala Lys Tyr Val Gly Ala Ala Pro Thr Pro Met Ala Phe Ser
            180                 185                 190

Glu Val Tyr Leu Ala Leu Gln Thr Asn Ser Val Asp Gly Gln Glu Asn
        195                 200                 205

Pro Leu Pro Thr Ile Gln Ala Gln Lys Phe Tyr Glu Val Gln Lys Tyr
    210                 215                 220

Leu Ala Leu Thr Asn His Ile Leu Asn Asp Gln Leu Tyr Leu Ile Ser
225                 230                 235                 240

Asn Asp Thr Leu Ala Asp Leu Pro Glu Asp Leu Gln Lys Val Val Lys
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aaacgac atg acg aaa gta att cat act gac aat gca cca gcc gcc att   949
        Met Thr Lys Val Ile His Thr Asp Asn Ala Pro Ala Ala Ile
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ggt cct tat gta caa gcg gta gat tta ggt aat atg ctg tta acc tct   997
Gly Pro Tyr Val Gln Ala Val Asp Leu Gly Asn Met Leu Leu Thr Ser
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ggg caa att cca gtg aat cca aaa acc ggt gaa gtg cca gcg gat atc   1045
Gly Gln Ile Pro Val Asn Pro Lys Thr Gly Glu Val Pro Ala Asp Ile
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gta gca caa gca cgt caa tcg tta gaa aac gtg aaa gcg att gtg gaa   1093
Val Ala Gln Ala Arg Gln Ser Leu Glu Asn Val Lys Ala Ile Val Glu
             50                  55                  60

caa gcg gga tta caa gtc gca aat atc gtg aaa acc acg gtg ttt gtg   1141
Gln Ala Gly Leu Gln Val Ala Asn Ile Val Lys Thr Thr Val Phe Val
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aaa gat tta aat gac ttt gca gcg gtc aat gcg gag tat gaa cgt ttc   1189
Lys Asp Leu Asn Asp Phe Ala Ala Val Asn Ala Glu Tyr Glu Arg Phe
     80                  85                  90

ttt aaa gag aac aat cac cct agc ttc cct gct cgt tca tgt gtg gaa   1237
Phe Lys Glu Asn Asn His Pro Ser Phe Pro Ala Arg Ser Cys Val Glu
 95                  100                 105                 110

gtg gca cgt ttg ccg aaa gat gtg ggg att gaa atc gag gca atc gct   1285
Val Ala Arg Leu Pro Lys Asp Val Gly Ile Glu Ile Glu Ala Ile Ala
                115                 120                 125


gta aaa gcc taatgaatag cttgcattta tcttagtcgt agcaaaacaa           1334
Val Lys Ala

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tattgatagc caaaaacgcc ctttactgat agagaataaa ctatgcaaaa tcaagtcatc 1454

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Ile Pro Val Asn Pro Lys Thr Gly Glu Val Pro Ala Asp Ile Val Ala
35 40 45

Gln Ala Arg Gln Ser Leu Glu Asn Val Lys Ala Ile Val Glu Gln Ala
50 55 60

Gly Leu Gln Val Ala Asn Ile Val Lys Thr Thr Val Phe Val Lys Asp
65 70 75 80

Leu Asn Asp Phe Ala Ala Val Asn Ala Glu Tyr Glu Arg Phe Phe Lys
85 90 95

Glu Asn Asn His Pro Ser Phe Pro Ala Arg Ser Cys Val Glu Val Ala
100 105 110

Arg Leu Pro Lys Asp Val Gly Ile Glu Ile Glu Ala Ile Ala Val Lys
115 120 125

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gtcagtcaca tttttatagg ttaactgaat tttttaaacg at atg acg caa aaa 474
Met Thr Gln Lys
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Leu His Ile Lys Thr Trp Gly Cys Gln Met Asn Glu Tyr Asp Ser Ser
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Lys Met Ala Asp Leu Leu Asn Ser Thr His Gly Leu Glu Leu Thr Glu
25 30 35

att ccg gaa gaa gcg gat gtg tta ttg tta aac act tgc tca att cgt 618
Ile Pro Glu Glu Ala Asp Val Leu Leu Leu Asn Thr Cys Ser Ile Arg
40 45 50

gaa aaa gca caa gaa aaa gtt ttc cat caa tta gga cgt tgg aaa gaa 666
Glu Lys Ala Gln Glu Lys Val Phe His Gln Leu Gly Arg Trp Lys Glu
55 60 65

tta aag aaa cat aag ccg gga ctc gtt atc ggt gtt ggg ggc tgt gtt 714
Leu Lys Lys His Lys Pro Gly Leu Val Ile Gly Val Gly Gly Cys Val
70 75 80

gcc tca caa gaa gga gaa cac att cgt act cgt gct cct tat gtc gat 762
Ala Ser Gln Glu Gly Glu His Ile Arg Thr Arg Ala Pro Tyr Val Asp
85 90 95 100

att att ttt gga cca caa acc tta cat cgt tta cct gaa atg atc aat 810
Ile Ile Phe Gly Pro Gln Thr Leu His Arg Leu Pro Glu Met Ile Asn
105 110 115

cag atc aga ggt ggt aaa agc tca gta gtc gat gtc agt ttt cca gaa 858
Gln Ile Arg Gly Gly Lys Ser Ser Val Val Asp Val Ser Phe Pro Glu
120 125 130

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att gaa aaa ttc gac cgt tta cca gaa ccg cgt gca gaa ggt cca act   906
Ile Glu Lys Phe Asp Arg Leu Pro Glu Pro Arg Ala Glu Gly Pro Thr
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gct ttc gta tcc att atg gaa ggc tgt aat aaa tat tgc tca ttc tgt   954
Ala Phe Val Ser Ile Met Glu Gly Cys Asn Lys Tyr Cys Ser Phe Cys
    150                 155                 160

gtc gtg cct tat acg cgt ggt gaa gaa gtc agt cgt cca gtg gat gat   1002
Val Val Pro Tyr Thr Arg Gly Glu Glu Val Ser Arg Pro Val Asp Asp
165                 170                 175                 180

gta tta ttt gaa att gca cag ttg gca gag caa ggc gtg cgt gaa gtg   1050
Val Leu Phe Glu Ile Ala Gln Leu Ala Glu Gln Gly Val Arg Glu Val
                185                 190                 195

aat tta tta gga caa aac gtg aac gct tat cgt ggt gca act cat gat   1098
Asn Leu Leu Gly Gln Asn Val Asn Ala Tyr Arg Gly Ala Thr His Asp
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gac ggt att tgt act ttt gcg gaa ttg tta cgt tta gta gcc gct att   1146
Asp Gly Ile Cys Thr Phe Ala Glu Leu Leu Arg Leu Val Ala Ala Ile
        215                 220                 225

gat ggt att gac cgt tta cgt ttt acc acc agt cac cca att gag ttc   1194
Asp Gly Ile Asp Arg Leu Arg Phe Thr Thr Ser His Pro Ile Glu Phe
    230                 235                 240

act gat gac att att gat gtg tac cgt gat acg cca gag ttg gtg agt   1242
Thr Asp Asp Ile Ile Asp Val Tyr Arg Asp Thr Pro Glu Leu Val Ser
245                 250                 255                 260

ttc tta cac tta cct gta caa agt ggt tct gat cgt gtg tta tct atg   1290
Phe Leu His Leu Pro Val Gln Ser Gly Ser Asp Arg Val Leu Ser Met
                265                 270                 275

atg aaa cgc aat cat acg gca tta gaa tat aaa tcg att att cgg aag   1338
Met Lys Arg Asn His Thr Ala Leu Glu Tyr Lys Ser Ile Ile Arg Lys
            280                 285                 290


tta aga gcg gtg cgt cca gag att caa att agc tca gat ttt att gtc   1386
Leu Arg Ala Val Arg Pro Glu Ile Gln Ile Ser Ser Asp Phe Ile Val
        295                 300                 305

ggt ttc ccg ggc gaa aca gca gaa gat ttc gag caa acc atg aat tta   1434
Gly Phe Pro Gly Glu Thr Ala Glu Asp Phe Glu Gln Thr Met Asn Leu
    310                 315                 320

att gca caa gta aat ttt gat atg agt ttc agc ttc att tat tca gca   1482
Ile Ala Gln Val Asn Phe Asp Met Ser Phe Ser Phe Ile Tyr Ser Ala
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cgt cca ggc acg cca gca gca gat atg cct gat gat gtg aca gaa gaa   1530
Arg Pro Gly Thr Pro Ala Ala Asp Met Pro Asp Asp Val Thr Glu Glu
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gag aag aaa caa cgt tta tat gtg ttg caa caa cgc att aac aat caa   1578
Glu Lys Lys Gln Arg Leu Tyr Val Leu Gln Gln Arg Ile Asn Asn Gln
            360                 365                 370

gcc gcg caa ttt agt cga gca atg tta ggc aca gaa cag cgc gtg tta   1626
Ala Ala Gln Phe Ser Arg Ala Met Leu Gly Thr Glu Gln Arg Val Leu
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gtg gaa gga ccc tcg aaa aaa gat tta atg gaa ctc aca ggg cgt aca   1674
Val Glu Gly Pro Ser Lys Lys Asp Leu Met Glu Leu Thr Gly Arg Thr
    390                 395                 400

gaa act aat cgt atc gtc aat ttt gtg ggc acg cct gat atg att ggg   1722
Glu Thr Asn Arg Ile Val Asn Phe Val Gly Thr Pro Asp Met Ile Gly
405                 410                 415                 420

aag ttt gtt gat atc aag atc acg gat gtg ttt act aac tca ctg cgt   1770
Lys Phe Val Asp Ile Lys Ile Thr Asp Val Phe Thr Asn Ser Leu Arg
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ggt gaa gtc gtt aga act gaa gaa caa atg gga ctt cgc gtt gtt caa   1818
Gly Glu Val Val Arg Thr Glu Glu Gln Met Gly Leu Arg Val Val Gln
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tcg cca caa atg gtg att aat cgt act cgt aaa gaa gat gaa ctc ggc   1866
Ser Pro Gln Met Val Ile Asn Arg Thr Arg Lys Glu Asp Glu Leu Gly
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Val Gly Arg Tyr His Ala
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Glu Leu Thr Glu Ile Pro Glu Glu Ala Asp Val Leu Leu Leu Asn Thr
        35                  40                  45

Cys Ser Ile Arg Glu Lys Ala Gln Glu Lys Val Phe His Gln Leu Gly
    50                  55                  60

Arg Trp Lys Glu Leu Lys Lys His Lys Pro Gly Leu Val Ile Gly Val
65                  70                  75                  80

Gly Gly Cys Val Ala Ser Gln Glu Gly Glu His Ile Arg Thr Arg Ala
                85                  90                  95

Pro Tyr Val Asp Ile Ile Phe Gly Pro Gln Thr Leu His Arg Leu Pro
            100                 105                 110

Glu Met Ile Asn Gln Ile Arg Gly Gly Lys Ser Ser Val Val Asp Val
        115                 120                 125

Ser Phe Pro Glu Ile Glu Lys Phe Asp Arg Leu Pro Glu Pro Arg Ala
    130                 135                 140

Glu Gly Pro Thr Ala Phe Val Ser Ile Met Glu Gly Cys Asn Lys Tyr
145                 150                 155                 160

Cys Ser Phe Cys Val Val Pro Tyr Thr Arg Gly Glu Glu Val Ser Arg
                165                 170                 175

Pro Val Asp Asp Val Leu Phe Glu Ile Ala Gln Leu Ala Glu Gln Gly
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Val Arg Glu Val Asn Leu Leu Gly Gln Asn Val Asn Ala Tyr Arg Gly
        195                 200                 205

Ala Thr His Asp Asp Gly Ile Cys Thr Phe Ala Glu Leu Leu Arg Leu
    210                 215                 220

Val Ala Ala Ile Asp Gly Ile Asp Arg Leu Arg Phe Thr Thr Ser His
225                 230                 235                 240

Pro Ile Glu Phe Thr Asp Asp Ile Ile Asp Val Tyr Arg Asp Thr Pro
                245                 250                 255

Glu Leu Val Ser Phe Leu His Leu Pro Val Gln Ser Gly Ser Asp Arg
            260                 265                 270

Val Leu Ser Met Met Lys Arg Asn His Thr Ala Leu Glu Tyr Lys Ser
        275                 280                 285

Ile Ile Arg Lys Leu Arg Ala Val Arg Pro Glu Ile Gln Ile Ser Ser
    290                 295                 300

Asp Phe Ile Val Gly Phe Pro Gly Glu Thr Ala Glu Asp Phe Glu Gln
305                 310                 315                 320

Thr Met Asn Leu Ile Ala Gln Val Asn Phe Asp Met Ser Phe Ser Phe
                325                 330                 335
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Ile Tyr Ser Ala Arg Pro Gly Thr Pro Ala Ala Asp Met Pro Asp Asp
            340                 345                 350

Val Thr Glu Glu Glu Lys Lys Gln Arg Leu Tyr Val Leu Gln Gln Arg
        355                 360                 365

Ile Asn Asn Gln Ala Ala Gln Phe Ser Arg Ala Met Leu Gly Thr Glu
    370                 375                 380

Gln Arg Val Leu Val Glu Gly Pro Ser Lys Lys Asp Leu Met Glu Leu
385                 390                 395                 400

Thr Gly Arg Thr Glu Thr Asn Arg Ile Val Asn Phe Val Gly Thr Pro
                405                 410                 415

Asp Met Ile Gly Lys Phe Val Asp Ile Lys Ile Thr Asp Val Phe Thr
            420                 425                 430

Asn Ser Leu Arg Gly Glu Val Val Arg Thr Glu Glu Gln Met Gly Leu
        435                 440                 445

Arg Val Val Gln Ser Pro Gln Met Val Ile Asn Arg Thr Arg Lys Glu
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Asp Glu Leu Gly Val Gly Arg Tyr His Ala
465                 470
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<210> 82
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acgtggttta cgtcatggcg ataaagtgaa gatcagctca cgtcgtggcg aaatgatttc 180

tcacttagat acccgtggac gtaataaagt cccacaaggc ttagtttaca ccactttctt 240

tgatgcaggt cagttagcaa actatctcac tttagatgcg acagacccaa tttcaaaaga 300

aacggacttc aaaaaatgtg cggtcaaagt ggaaaaagcg taacacgtta aatttaatga 360

ggaacgaccg cactttgctt tcagtaaagt gcggttggaa agtcga atg aaa aaa 415
                                                Met Lys Lys
                                                  1

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aca gtt gtg aat cct gaa cgt cgt cga ttt ttt aaa gag gct acg cgc   463
Thr Val Val Asn Pro Glu Arg Arg Arg Phe Phe Lys Glu Ala Thr Arg
      5                  10                  15

act gca ggc ggg ttg gca ggg gtg act ttg ctc ctt ggt ttg caa caa   511
Thr Ala Gly Gly Leu Ala Gly Val Thr Leu Leu Leu Gly Leu Gln Gln
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aag cag agt ctt gcg cgc gaa ggc gtg gcg tta cgc cca cct ttt gcc   559
Lys Gln Ser Leu Ala Arg Glu Gly Val Ala Leu Arg Pro Pro Phe Ala
                 40                  45                  50

ctt gag aat gag aaa gcg ttt tct gct gcg tgc att cgt tgt ggt cag   607
Leu Glu Asn Glu Lys Ala Phe Ser Ala Ala Cys Ile Arg Cys Gly Gln
             55                  60                  65

tgt gta caa gcc tgt cca cat gag atg ttg cat ctt gcc tca ctg att   655
Cys Val Gln Ala Cys Pro His Glu Met Leu His Leu Ala Ser Leu Ile
         70                  75                  80

tca ccg atg gaa gca ggt aca ccg tat ttc att gcg cgc gat aag ccc   703
Ser Pro Met Glu Ala Gly Thr Pro Tyr Phe Ile Ala Arg Asp Lys Pro
     85                  90                  95

tgt gaa atg tgt gtg gat att cct tgt gca aaa gcc tgc cca acc ggt   751
Cys Glu Met Cys Val Asp Ile Pro Cys Ala Lys Ala Cys Pro Thr Gly
100                 105                 110                 115

gca ttg gat aat caa gca aca gaa atc gat gat gcg cgt atg ggg tta   799
Ala Leu Asp Asn Gln Ala Thr Glu Ile Asp Asp Ala Arg Met Gly Leu
                120                 125                 130

gct gtc ctg cta gat cat gaa act tgt ctg aac tgg caa ggt tta cgc   847
Ala Val Leu Leu Asp His Glu Thr Cys Leu Asn Trp Gln Gly Leu Arg
            135                 140                 145

tgt gat gtg tgt tat cgc gtc tgt ccg ctg att aat aaa gcg att acg   895
Cys Asp Val Cys Tyr Arg Val Cys Pro Leu Ile Asn Lys Ala Ile Thr
        150                 155                 160

tta gtg atg cat cgt aat gag cgt acg ggt aag cac gcc gtc ttt atc   943
Leu Val Met His Arg Asn Glu Arg Thr Gly Lys His Ala Val Phe Ile
    165                 170                 175

cca aca gtg cat tcc gaa gcc tgt aca gga tgt ggc aaa tgt gaa gaa   991
Pro Thr Val His Ser Glu Ala Cys Thr Gly Cys Gly Lys Cys Glu Glu
180                 185                 190                 195

gct tgc gtt cta gaa gaa gcg gca atc aaa gtg tta ccg atg gca tta   1039
Ala Cys Val Leu Glu Glu Ala Ala Ile Lys Val Leu Pro Met Ala Leu
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gcg aaa ggc atg tta ggt aaa cat tac cgt tta ggt tgg gaa gag aaa   1087
Ala Lys Gly Met Leu Gly Lys His Tyr Arg Leu Gly Trp Glu Glu Lys
            215                 220                 225

gaa aaa gcc ggg cat tcc ctt gcg cca gaa ggc att att tct ctc ccg   1135
Glu Lys Ala Gly His Ser Leu Ala Pro Glu Gly Ile Ile Ser Leu Pro
        230                 235                 240

act cgg tta ccg gag agc ttg taatggcaaa ttcaccaaaa tatgcgggta      1186
Thr Arg Leu Pro Glu Ser Leu
    245                 250

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taacccagct gagtattctt gccatgtttt taagcggacc ttattttggg gtgtggatct 1306

tgaaaggcaa ttacagtagt agtcttttgc ttgatttgat cccgatgact gatcctttga 1366
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cgttaaacat cgtgacagat gcgtccgctt ggctcagacg taaattagaa attcgtcaat 1546

cggcaaaact cccacgaagt ttacgctatg cgatcttagt gatgattttg ttaggcagtg 1606

cgctaagcgg gttattactt tgggaatggc tcaatccggt tgcagcacta ggtcgtgcgt 1666

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tttgccctga aaaagtattt atttttacaa cacgatttaa tcattcagtt aatcattcgg 2026

gggagtgatc aaaatgaaaa aaacaatgct aattttgacc gcacttttg ccttcacggt 2086

caatgccaat gaagtcaaag tgggcaaaag tttacaagat tcacctgaaa atatcgcgcc 2146

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caccgcccat tgatccgtga gtgcccatgc cacagttaga ccaagctgtt ttatgtcttg 4786

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<211> 250
<212> PRT
<213> Pasteurella multocida

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Ala Thr Arg Thr Ala Gly Gly Leu Ala Gly Val Thr Leu Leu Leu Gly

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Leu Gln Gln Lys Gln Ser Leu Ala Arg Glu Gly Val Ala Leu Arg Pro
         35                  40                  45

Pro Phe Ala Leu Glu Asn Glu Lys Ala Phe Ser Ala Ala Cys Ile Arg
     50                  55                  60

Cys Gly Gln Cys Val Gln Ala Cys Pro His Glu Met Leu His Leu Ala
 65                  70                  75                  80

Ser Leu Ile Ser Pro Met Glu Ala Gly Thr Pro Tyr Phe Ile Ala Arg
                85                  90                  95

Asp Lys Pro Cys Glu Met Cys Val Asp Ile Pro Cys Ala Lys Ala Cys
            100                 105                 110

Pro Thr Gly Ala Leu Asp Asn Gln Ala Thr Glu Ile Asp Asp Ala Arg
        115                 120                 125

Met Gly Leu Ala Val Leu Leu Asp His Glu Thr Cys Leu Asn Trp Gln
    130                 135                 140

Gly Leu Arg Cys Asp Val Cys Tyr Arg Val Cys Pro Leu Ile Asn Lys
145                 150                 155                 160

Ala Ile Thr Leu Val Met His Arg Asn Glu Arg Thr Gly Lys His Ala
                165                 170                 175

Val Phe Ile Pro Thr Val His Ser Glu Ala Cys Thr Gly Cys Gly Lys
            180                 185                 190

Cys Glu Glu Ala Cys Val Leu Glu Glu Ala Ala Ile Lys Val Leu Pro
        195                 200                 205

Met Ala Leu Ala Lys Gly Met Leu Gly Lys His Tyr Arg Leu Gly Trp
    210                 215                 220

Glu Glu Lys Glu Lys Ala Gly His Ser Leu Ala Pro Glu Gly Ile Ile
225                 230                 235                 240

Ser Leu Pro Thr Arg Leu Pro Glu Ser Leu
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<212> DNA
<213> Pasteurella multocida

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<222> (2411)..(2719)

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<223> yyaM

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gaaaatgctt tacgcgaata tggttgttat ctaggcacag cttttcaatt agtcgatgat 180

attttagatt atagtgcaga tgcaaaagca ctcggcaaaa atattggtga tgatttagcg 240

gaaggtaaac caacattacc gttattacac gccatgcatc acggcaatcc agcacaagca 300

aaattgattc gcgaagcgat tgagcaaggg ggtaagcgtg atattttaga ggatgtactg 360

acaattatga cagaacataa atccctcgac tatgcgatga tgcgcgctaa acaagaagca 420

caaaaagccg ttgatgcgat tgcattattg cctgaaaatg aatataaaca agcgttaatt 480

tcattagctt acttatccgt cgatcgcgct tattaaccac ttaataaggc gagacatgtt 540

agcgtaacga ccgcctaaag tgcggtcatt tatttagtaa ttttaaacac gacaatgaca 600

gaacaaaaca tccctacgaa aaaaacacgc aaaggcaaag atcctcacgc gccttttgta 660

cgcgaaaaat tatccctacc aaatgggcat aacaaattgt tattgcattc ttgttgtgcg 720

ccttgctcgg gagaagtaat ggaggcaatt catgcttcag gtattgaatt tactatttac 780

ttctacaacc caaacattca cccattaaaa gaatatctca ttcgtaaaga agaaaatatt 840

cgttttgcgg aaaaatgggg cattccgttt attgatgccg attatgatcg tcaagaatgg 900

tttgaccgtg ccaaaggcat ggaagatgag ccagagcgtg gtattcgttg cactatgtgc 960

tttgatatgc gttttgaaaa agccgcagaa tatgcacaca acaatggttt ccccgtattt 1020

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cgtgccgccg aaaaatatga tgatgtagtg tattgggatt ataactggcg taaaggtggt 1140

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cggcacaagc gagaggattg ccaccaaagg tggtgccatg cacgccaggt gcaaaacttt 1740

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aattatagtg cactgtttgt ctccatttta cagatgaaac gtaatgaggt ggtatttagt 1920

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gaaattattg gtcgtggggt aagggagtta aaataccgtc cagctggagc aaaaagttgg 2220

tggtggccat ttggtcgtgc tgaaggcagt agcggactga aaacaggtac ctattttatg 2280

cagttaagcg ccttagggaa gcaaagtgcg gtggtgatga ccgatgatga tggcaatgcg 2340

ttatctgggg agcaagctca ggcgctttat caagcattac aaaatctctt agcgaaataa 2400

tacagtcaag atg act aaa ctc agt atc cag cga gat aac ttg att tgt    2449
           Met Thr Lys Leu Ser Ile Gln Arg Asp Asn Leu Ile Cys
             1               5                  10

ttg agt tat gtc gca tta atg gga ttc ggc ttt ccc att atg cgt tat   2497
Leu Ser Tyr Val Ala Leu Met Gly Phe Gly Phe Pro Ile Met Arg Tyr
     15                  20                  25

atg agt att cat ttt gat aca tta aat aat aac gct gtt cgc ttt ctc   2545
Met Ser Ile His Phe Asp Thr Leu Asn Asn Asn Ala Val Arg Phe Leu
 30                  35                  40                  45

tca ggg ggc agc gtt ttt att tta gcc tgt ttt ttt tat tat cgc gct   2593
Ser Gly Gly Ser Val Phe Ile Leu Ala Cys Phe Phe Tyr Tyr Arg Ala
                 50                  55                  60

gag tta aca tct tcg ggg gct ggc gtc cag tcc gtt gcg atg ttg ccg   2641
Glu Leu Thr Ser Ser Gly Ala Gly Val Gln Ser Val Ala Met Leu Pro
             65                  70                  75

agt tca agt tta ggt ttc tta ata ttg aaa act gta cca tct ttt tca   2689
Ser Ser Ser Leu Gly Phe Leu Ile Leu Lys Thr Val Pro Ser Phe Ser
         80                  85                  90

tac gtt aca atc tca aca ctt aat cgc gtt tgaccttccg atttttgata     2739
Tyr Val Thr Ile Ser Thr Leu Asn Arg Val
     95                  100

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cgataaagcg tcaaacgaaa gcacgacttt accgtccttg acttccacct gatcttcaat 2919

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actgtctagc ttgtcagcag tagatttatt cacagtcgct tgtgattgct tgtgttgaat 3459
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Val Ala Leu Met Gly Phe Gly Phe Pro Ile Met Arg Tyr Met Ser Ile
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His Phe Asp Thr Leu Asn Asn Asn Ala Val Arg Phe Leu Ser Gly Gly
35 40 45

Ser Val Phe Ile Leu Ala Cys Phe Phe Tyr Tyr Arg Ala Glu Leu Thr
50 55 60

Ser Ser Gly Ala Gly Val Gln Ser Val Ala Met Leu Pro Ser Ser Ser
65 70 75 80

Leu Gly Phe Leu Ile Leu Lys Thr Val Pro Ser Phe Ser Tyr Val Thr
85 90 95

Ile Ser Thr Leu Asn Arg Val
100

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<211> 19
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<220>
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<210> 87
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<220>
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<400> 87
cggccggtac cggcctagg 19

<210> 88
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<212> DNA
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<220>
<223> Description of Artificial Sequence: primer

<400> 88
catggtaccc attctaac 18

<210> 89
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<400> 89
ctaggtacct acaacctc 18

<210> 90
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<223> n = A or T or G or C

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<223> n = A or T or G or C

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<400> 90
ctaggtacct acaacctcaa gcttnknknk nknknknknk nknknknknk nknknknknk 60

nknknknknk nknknknknk nknknknknk nknkaagctt ggttagaatg ggtaccatg 119

<210> 91
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 91
tacctacaac ctcaagct 18

<210> 92
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 92
tacccattct aaccaagc 18

<210> 93
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 93
tacctacaac ctcaagctt 19

<210> 94
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 94
tacccattct aaccaagctt 20

<210> 95
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 95
ggcagagcat tacgctgac 19

<210> 96
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 96
gtaccggcca ggcggccacg cgtattc 27

<210> 97
<211> 531
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> atpG

<400> 97
tgttgagctt ggtttagtag ggtcgaaagg cgtaagcttt taccaaaatc taggcttaaa 60

cgtgagatct caagtaacgg gattaggcga taatccggaa atggaacgta tcgtgggcgc 120

agttaatgaa atgattaatg cgttccgaaa cggagaagtg gatgcggttt acgtcgctta 180

caaccgtttt gaaaatacga tgtcacaaaa acctgttatc gcacagttac ttccgttacc 240

taaactagat gacgatgaat tagatacgaa aggttcatgg gattatattt atgaaccgaa 300

tccacaagtt ttattggata gtttacttgt tcgttattta gaaactcagg tataccaagc 360

agttgtagat aacctagctt ctgaacaagc cgctcgaatg gtagcgatga aagccgcaac 420

agataatgcg ggtacattaa tcgatgaatt acaattagtg tataacaaag ctcgccaagc 480

aagcattaca aatgaattaa acgaaattgt tgcgggtgcc gcagcaattt a 531

<210> 98
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 98
tctccattcc cttgctgcgg cacccc 25

<210> 99
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 99
ggattacagc cggatccggg 20

<210> 100
<211> 1034
<212> DNA
<213> Pasteurella multocida

<220>
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<222> (1)..(1032)

<400> 100
atg ttt aaa aat aaa aca ctt tta att aca ggt gga acg ggt tct ttt 48
Met Phe Lys Asn Lys Thr Leu Leu Ile Thr Gly Gly Thr Gly Ser Phe
1 5 10 15

ggt aat gct gta ctc aaa cgt ttc tta gaa aca gat att cga gaa att 96
Gly Asn Ala Val Leu Lys Arg Phe Leu Glu Thr Asp Ile Arg Glu Ile
20 25 30

cgt gtt ttt tcg cgt gat gag aag aaa caa gat gac atg cgg aaa aaa 144
Arg Val Phe Ser Arg Asp Glu Lys Lys Gln Asp Asp Met Arg Lys Lys
35 40 45

tat aat gat gca aaa tta aaa ttt tat att ggc gat gtt cgt gac tac 192
Tyr Asn Asp Ala Lys Leu Lys Phe Tyr Ile Gly Asp Val Arg Asp Tyr
50 55 60

gat agt att tta aat gcc tcg cga ggt gtt gac tat att tat cat gct 240
Asp Ser Ile Leu Asn Ala Ser Arg Gly Val Asp Tyr Ile Tyr His Ala
65 70 75 80

gcc gca tta aag caa gtg cct tca tgc gag ttt tat ccg tta gag gca 288
Ala Ala Leu Lys Gln Val Pro Ser Cys Glu Phe Tyr Pro Leu Glu Ala
85 90 95

gtg aaa acc aat att tta ggt acg gca aat gtc tta gaa gcc gcc atc 336
Val Lys Thr Asn Ile Leu Gly Thr Ala Asn Val Leu Glu Ala Ala Ile
100 105 110

caa aac cag ata aaa cgc gtc gtc tgt ctt agc aca gat aaa gcg gtg 384
Gln Asn Gln Ile Lys Arg Val Val Cys Leu Ser Thr Asp Lys Ala Val
115 120 125

tac cca att aat gcg atg ggc att tct aaa gca atg atg gaa aaa gtc 432
Tyr Pro Ile Asn Ala Met Gly Ile Ser Lys Ala Met Met Glu Lys Val

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    130                 135                 140

atc atc gca aaa tcg cgt aac cta gaa ggc aca cca acg aca atc tgt   480
Ile Ile Ala Lys Ser Arg Asn Leu Glu Gly Thr Pro Thr Thr Ile Cys
145                 150                 155                 160

tgt act cgc tat ggc aat gtc atg gca tcg cgt ggt tcg gtt atc cca   528
Cys Thr Arg Tyr Gly Asn Val Met Ala Ser Arg Gly Ser Val Ile Pro
                165                 170                 175

tta ttt gtc gat caa ata cgt caa ggc aag cct ttt act att act gat   576
Leu Phe Val Asp Gln Ile Arg Gln Gly Lys Pro Phe Thr Ile Thr Asp
            180                 185                 190

cct gag atg aca cgc ttt atg atg aca ttg gaa gat gct gtg gat tta   624
Pro Glu Met Thr Arg Phe Met Met Thr Leu Glu Asp Ala Val Asp Leu
        195                 200                 205

gtc cta tat gca ttt aaa aat ggt caa aat ggt gat gtt ttt gta caa   672
Val Leu Tyr Ala Phe Lys Asn Gly Gln Asn Gly Asp Val Phe Val Gln
    210                 215                 220

aaa gcc ccc gca gca acc att ggt acc ctt gcc aaa gca att acc gaa   720
Lys Ala Pro Ala Ala Thr Ile Gly Thr Leu Ala Lys Ala Ile Thr Glu
225                 230                 235                 240

tta tta tct gtc cca aat cac cct att tcc att ata ggt acg cgt cat   768
Leu Leu Ser Val Pro Asn His Pro Ile Ser Ile Ile Gly Thr Arg His
                245                 250                 255

gga gag aaa gca ttc gaa gct tta tta agc cgt gaa gaa atg gtt cat   816
Gly Glu Lys Ala Phe Glu Ala Leu Leu Ser Arg Glu Glu Met Val His
            260                 265                 270

gca att aat gaa ggt aat tat tat cgc atc cca gcc gat caa cgc agt   864
Ala Ile Asn Glu Gly Asn Tyr Tyr Arg Ile Pro Ala Asp Gln Arg Ser
        275                 280                 285

tta aat tac agt aaa tat gtc gaa aaa ggg gaa cca aaa att acc gaa   912
Leu Asn Tyr Ser Lys Tyr Val Glu Lys Gly Glu Pro Lys Ile Thr Glu
    290                 295                 300

gtc acc gac tac aac tca cat aat act gag cgt ttg act gtc aag gaa   960
Val Thr Asp Tyr Asn Ser His Asn Thr Glu Arg Leu Thr Val Lys Glu
305                 310                 315                 320

atg aag cag tta ctg ctt aaa ctt gaa ttc ata cag aaa atg att gag  1008
Met Lys Gln Leu Leu Leu Lys Leu Glu Phe Ile Gln Lys Met Ile Glu
                325                 330                 335

ggt gaa tac atc tca ccg gag gta ta                               1034
Gly Glu Tyr Ile Ser Pro Glu Val
            340
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<210> 101
<211> 344
<212> PRT
<213> Pasteurella multocida

<400> 101

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Met Phe Lys Asn Lys Thr Leu Leu Ile Thr Gly Gly Thr Gly Ser Phe
  1               5                  10                  15

Gly Asn Ala Val Leu Lys Arg Phe Leu Glu Thr Asp Ile Arg Glu Ile
            20                  25                  30

Arg Val Phe Ser Arg Asp Glu Lys Lys Gln Asp Asp Met Arg Lys Lys
        35                  40                  45

Tyr Asn Asp Ala Lys Leu Lys Phe Tyr Ile Gly Asp Val Arg Asp Tyr
    50                  55                  60

Asp Ser Ile Leu Asn Ala Ser Arg Gly Val Asp Tyr Ile Tyr His Ala
65                  70                  75                  80

Ala Ala Leu Lys Gln Val Pro Ser Cys Glu Phe Tyr Pro Leu Glu Ala
                85                  90                  95

Val Lys Thr Asn Ile Leu Gly Thr Ala Asn Val Leu Glu Ala Ala Ile
            100                 105                 110

Gln Asn Gln Ile Lys Arg Val Val Cys Leu Ser Thr Asp Lys Ala Val
        115                 120                 125

Tyr Pro Ile Asn Ala Met Gly Ile Ser Lys Ala Met Met Glu Lys Val
    130                 135                 140

Ile Ile Ala Lys Ser Arg Asn Leu Glu Gly Thr Pro Thr Thr Ile Cys
145                 150                 155                 160

Cys Thr Arg Tyr Gly Asn Val Met Ala Ser Arg Gly Ser Val Ile Pro
                165                 170                 175

Leu Phe Val Asp Gln Ile Arg Gln Gly Lys Pro Phe Thr Ile Thr Asp
            180                 185                 190

Pro Glu Met Thr Arg Phe Met Met Thr Leu Glu Asp Ala Val Asp Leu
        195                 200                 205

Val Leu Tyr Ala Phe Lys Asn Gly Gln Asn Gly Asp Val Phe Val Gln
    210                 215                 220

Lys Ala Pro Ala Ala Thr Ile Gly Thr Leu Ala Lys Ala Ile Thr Glu
225                 230                 235                 240

Leu Leu Ser Val Pro Asn His Pro Ile Ser Ile Ile Gly Thr Arg His
                245                 250                 255

Gly Glu Lys Ala Phe Glu Ala Leu Leu Ser Arg Glu Glu Met Val His
            260                 265                 270

Ala Ile Asn Glu Gly Asn Tyr Tyr Arg Ile Pro Ala Asp Gln Arg Ser
        275                 280                 285

Leu Asn Tyr Ser Lys Tyr Val Glu Lys Gly Glu Pro Lys Ile Thr Glu
    290                 295                 300

Val Thr Asp Tyr Asn Ser His Asn Thr Glu Arg Leu Thr Val Lys Glu
305                 310                 315                 320

Met Lys Gln Leu Leu Leu Lys Leu Glu Phe Ile Gln Lys Met Ile Glu
                325                 330                 335
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Gly Glu Tyr Ile Ser Pro Glu Val
            340


<210> 102
<211> 4931
<212> DNA
<213> Pasteurella multocida

<220>
<223> fhaB2

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<222> (1)..(4929)

<220>
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<400> 102
atg aac aaa aat cgt tac aaa ctc att ttt agt caa gtc aaa ggt tgt   48
Met Asn Lys Asn Arg Tyr Lys Leu Ile Phe Ser Gln Val Lys Gly Cys
  1               5                  10                  15

ctc gtt cct gtg gca gaa tgt att aac tca gct att agc aat ggt tca   96
Leu Val Pro Val Ala Glu Cys Ile Asn Ser Ala Ile Ser Asn Gly Ser
             20                  25                  30

tct gat tca aca tcc aca tca gaa caa gtt gaa gag gaa cct ttc ctt   144
Ser Asp Ser Thr Ser Thr Ser Glu Gln Val Glu Glu Pro Phe Leu
         35                  40                  45

cta gaa caa tat tca ctt tcc tcc gtg tct tta tta gta aaa agc acg   192
Leu Glu Gln Tyr Ser Leu Ser Ser Val Ser Leu Leu Val Lys Ser Thr
     50                  55                  60

ttc aat cct gtt tcg tat gca atg caa ttg act tgg aaa cag ctt tct   240
Phe Asn Pro Val Ser Tyr Ala Met Gln Leu Thr Trp Lys Gln Leu Ser
 65                  70                  75                  80

att tta ttt tta act gtg att tct gtt cct gtt ttg gct gag gga aaa   288
Ile Leu Phe Leu Thr Val Ile Ser Val Pro Val Leu Ala Glu Gly Lys
                 85                  90                  95

ggg gat gaa aga aat caa tta aca gtg att gat aat agc gat cat att   336
Gly Asp Glu Arg Asn Gln Leu Thr Val Ile Asp Asn Ser Asp His Ile
            100                 105                 110

aaa tta gat gca tct aat ctt gct ggt aat gat aaa aca aaa atc tat   384
Lys Leu Asp Ala Ser Asn Leu Ala Gly Asn Asp Lys Thr Lys Ile Tyr
        115                 120                 125

caa gca gaa aat aaa gtt ctg gtt att gat att gct aaa cca aat ggg   432
Gln Ala Glu Asn Lys Val Leu Val Ile Asp Ile Ala Lys Pro Asn Gly
    130                 135                 140

aaa ggg att tca gat aac cgt ttt gaa aaa ttt aat att cca aat agc   480
Lys Gly Ile Ser Asp Asn Arg Phe Glu Lys Phe Asn Ile Pro Asn Ser
145                 150                 155                 160

gcg gtg ttt aat aat aat ggg act gaa gcg cag gca aga tca aca tta   528
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Ala Val Phe Asn Asn Asn Gly Thr Glu Ala Gln Ala Arg Ser Thr Leu
                165                 170                 175

att ggt tac att ccg caa aat caa aat tta agg gga ggg aaa gaa gct   576
Ile Gly Tyr Ile Pro Gln Asn Gln Asn Leu Arg Gly Gly Lys Glu Ala
            180                 185                 190

gat gtt ata tta aat caa gtg aca ggt cct caa gaa agt aaa att gtt   624
Asp Val Ile Leu Asn Gln Val Thr Gly Pro Gln Glu Ser Lys Ile Val
        195                 200                 205

ggc gcg ctt gaa gta tta ggt aaa aaa gct gat atc gtc att gca aac   672
Gly Ala Leu Glu Val Leu Gly Lys Lys Ala Asp Ile Val Ile Ala Asn
    210                 215                 220

caa aat ggt att acc tta aat ggt gta aga aca ata aat tca gat cgt   720
Gln Asn Gly Ile Thr Leu Asn Gly Val Arg Thr Ile Asn Ser Asp Arg
225                 230                 235                 240

ttt gtt gcc act acg agt gag ctt ata gat ccg aat cag atg atg tta   768
Phe Val Ala Thr Thr Ser Glu Leu Ile Asp Pro Asn Gln Met Met Leu
                245                 250                 255

aag gtt aca aaa gga aat gtg atc att gat att gat ggt ttt tcg aca   816
Lys Val Thr Lys Gly Asn Val Ile Ile Asp Ile Asp Gly Phe Ser Thr
            260                 265                 270

gat gga tta aag tat tta gat att att gct aaa aaa att gaa caa aag   864
Asp Gly Leu Lys Tyr Leu Asp Ile Ile Ala Lys Lys Ile Glu Gln Lys
        275                 280                 285

caa tca att aca tca ggg gat aat tca gaa gca aaa aca gat gtc act   912
Gln Ser Ile Thr Ser Gly Asp Asn Ser Glu Ala Lys Thr Asp Val Thr
    290                 295                 300

ctt att gcg ggt tcc agt gaa tat gat tta agc aaa cat gag ctg aaa   960
Leu Ile Ala Gly Ser Ser Glu Tyr Asp Leu Ser Lys His Glu Leu Lys
305                 310                 315                 320

aaa acg agc ggt gaa aat gta tct aat gat gtt att gct atc acg gga  1008
Lys Thr Ser Gly Glu Asn Val Ser Asn Asp Val Ile Ala Ile Thr Gly
                325                 330                 335

tct agt aca ggc gca atg cat ggt aaa aat att aag ttg att gtg aca  1056
Ser Ser Thr Gly Ala Met His Gly Lys Asn Ile Lys Leu Ile Val Thr
            340                 345                 350

gat aaa ggt gca ggc gta aaa cat gat gga att att ttg tct gaa aat  1104
Asp Lys Gly Ala Gly Val Lys His Asp Gly Ile Ile Leu Ser Glu Asn
        355                 360                 365

gat att cag att gaa atg aat gaa ggt gac tta gaa ctt ggc aat acg  1152
Asp Ile Gln Ile Glu Met Asn Glu Gly Asp Leu Glu Leu Gly Asn Thr
    370                 375                 380

att cag caa aca gtg gta aaa aaa gac cga aat att cga gcc aag aaa  1200
Ile Gln Gln Thr Val Val Lys Lys Asp Arg Asn Ile Arg Ala Lys Lys
385                 390                 395                 400

aaa att gaa gtg aaa aac gct aat cgt gtt ttt gtt ggt agt caa acg  1248
Lys Ile Glu Val Lys Asn Ala Asn Arg Val Phe Val Gly Ser Gln Thr
                405                 410                 415
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aaa tca gat gaa att tcg tta gag gcg aaa caa gtt aaa atc aga aaa   1296
Lys Ser Asp Glu Ile Ser Leu Glu Ala Lys Gln Val Lys Ile Arg Lys
            420                 425                 430

aac gca gag att agg agt acg aca caa gcc aaa atc gta gca aag ggt   1344
Asn Ala Glu Ile Arg Ser Thr Thr Gln Ala Lys Ile Val Ala Lys Gly
        435                 440                 445

gcc ctg tct att gag caa aat gcg aag ctc gtc gct aaa aag ata gat   1392
Ala Leu Ser Ile Glu Gln Asn Ala Lys Leu Val Ala Lys Lys Ile Asp
    450                 455                 460

gtg gca aca gaa act cta act aat gct ggg cgt att tat ggt cga gag   1440
Val Ala Thr Glu Thr Leu Thr Asn Ala Gly Arg Ile Tyr Gly Arg Glu
465                 470                 475                 480

gtt aag ctt gac act aat aat ttg att aat gat aaa gaa att tat gct   1488
Val Lys Leu Asp Thr Asn Asn Leu Ile Asn Asp Lys Glu Ile Tyr Ala
                485                 490                 495

gaa cgg aaa ttg agt att ttg acg aaa gga aaa gat ctt gaa att att   1536
Glu Arg Lys Leu Ser Ile Leu Thr Lys Gly Lys Asp Leu Glu Ile Ile
            500                 505                 510

caa gat aga tat ttg tct cca ctg atg cgc gta aaa agt agt gtc cgc   1584
Gln Asp Arg Tyr Leu Ser Pro Leu Met Arg Val Lys Ser Ser Val Arg
        515                 520                 525

ttt tta ggc tct ccg ttt ttc tca ata tct ccg tcg atg ctc gca agc   1632
Phe Leu Gly Ser Pro Phe Phe Ser Ile Ser Pro Ser Met Leu Ala Ser
    530                 535                 540

ctt agt gca cag ttt aag cct ggt ttt gtg aat aag gga ctc att gaa   1680
Leu Ser Ala Gln Phe Lys Pro Gly Phe Val Asn Lys Gly Leu Ile Glu
545                 550                 555                 560

agt gcg ggg agt gca gaa tta act ttt aaa gaa aaa acc agt ttt tta   1728
Ser Ala Gly Ser Ala Glu Leu Thr Phe Lys Glu Lys Thr Ser Phe Leu
                565                 570                 575

aca gag ggc aat aat ttt att aga gct aaa gat gcg tta act att aac   1776
Thr Glu Gly Asn Asn Phe Ile Arg Ala Lys Asp Ala Leu Thr Ile Asn
            580                 585                 590

gcc caa aat att gaa att gat aaa aat caa gat att caa ttg ggt gct   1824
Ala Gln Asn Ile Glu Ile Asp Lys Asn Gln Asp Ile Gln Leu Gly Ala
        595                 600                 605

aat ata acg ttg aat gtg gaa gaa aac ttt gtt aat cgt gca gga aca   1872
Asn Ile Thr Leu Asn Val Glu Glu Asn Phe Val Asn Arg Ala Gly Thr
    610                 615                 620

ctg gca act ggt aaa aca ctg aca att aat acc gaa agt ggc agt att   1920
Leu Ala Thr Gly Lys Thr Leu Thr Ile Asn Thr Glu Ser Gly Ser Ile
625                 630                 635                 640

tac aat ctt ggt ggg aca tta ggt gct gga aaa tca tta aaa ctg act   1968
Tyr Asn Leu Gly Gly Thr Leu Gly Ala Gly Lys Ser Leu Lys Leu Thr
                645                 650                 655

gct aaa tca acg gaa gaa ggt atg gga aat att gtt aac caa gaa aac   2016
Ala Lys Ser Thr Glu Glu Gly Met Gly Asn Ile Val Asn Gln Glu Asn
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                660                 665                 670

ggt tta ttc cat aca ctc ggt aat atg atg tta gaa gca gag cgt tct   2064
Gly Leu Phe His Thr Leu Gly Asn Met Met Leu Glu Ala Glu Arg Ser
        675                 680                 685

gtt tat aat att ggc gat att tat gcg agt aaa aaa tta aca gtt cat   2112
Val Tyr Asn Ile Gly Asp Ile Tyr Ala Ser Lys Lys Leu Thr Val His
    690                 695                 700

act cat aat ttg att aat gat gtg cgt tta tct ggc aat gtg agt tat   2160
Thr His Asn Leu Ile Asn Asp Val Arg Leu Ser Gly Asn Val Ser Tyr
705                 710                 715                 720

aag cct atc ggt tca agt cgt gat tat gat atc agt cgt gtt gcg gta   2208
Lys Pro Ile Gly Ser Ser Arg Asp Tyr Asp Ile Ser Arg Val Ala Val
                725                 730                 735

cat ggt tgg cac aat aat gtt tat aag ctc aac tta aat ctg caa gaa   2256
His Gly Trp His Asn Asn Val Tyr Lys Leu Asn Leu Asn Leu Gln Glu
            740                 745                 750

caa gat aaa acc gat att aaa gtt gtg aaa atg ggg gct atc cgt tct   2304
Gln Asp Lys Thr Asp Ile Lys Val Val Lys Met Gly Ala Ile Arg Ser
        755                 760                 765

gat ggt gat ttt gac ttt aag gga ata aag gcg aca tca tca gaa tca   2352
Asp Gly Asp Phe Asp Phe Lys Gly Ile Lys Ala Thr Ser Ser Glu Ser
    770                 775                 780

aaa ccg cag tta att aat cat gga tta att aat gtc aaa gga aca ttt   2400
Lys Pro Gln Leu Ile Asn His Gly Leu Ile Asn Val Lys Gly Thr Phe
785                 790                 795                 800

aat gcg gaa gct gat caa gtg gtg aac caa atg aaa gcg ttt aac caa   2448
Asn Ala Glu Ala Asp Gln Val Val Asn Gln Met Lys Ala Phe Asn Gln
                805                 810                 815

aat gca tta gca agc gtg ttt aag aat cca gcg aaa atc acg atg tac   2496
Asn Ala Leu Ala Ser Val Phe Lys Asn Pro Ala Lys Ile Thr Met Tyr
            820                 825                 830

tat caa cca ctt act cgt tat att tgg aca cca tta tcg ggt aat gca   2544
Tyr Gln Pro Leu Thr Arg Tyr Ile Trp Thr Pro Leu Ser Gly Asn Ala
        835                 840                 845

tcg cgt gaa ttt aac aat tta gag tct ttc ctc gat gcc ttg ttt ggc   2592
Ser Arg Glu Phe Asn Asn Leu Glu Ser Phe Leu Asp Ala Leu Phe Gly
    850                 855                 860

tca aca aca atc tta aaa tca agt ttc tat agt acg gaa aat ttt agt   2640
Ser Thr Thr Ile Leu Lys Ser Ser Phe Tyr Ser Thr Glu Asn Phe Ser
865                 870                 875                 880


gct tat cag ctt cta tct cat att cag cat tca cca atg tac caa aaa   2688
Ala Tyr Gln Leu Leu Ser His Ile Gln His Ser Pro Met Tyr Gln Lys
                885                 890                 895

gcg atg gca caa gtg ttt ggt gca gag tgg cat agt aaa tcc tat gat   2736
Ala Met Ala Gln Val Phe Gly Ala Glu Trp His Ser Lys Ser Tyr Asp
            900                 905                 910
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gag atg cga aac aaa tgg aaa agc ttt aaa gaa aat cca aca gat ttc   2784
Glu Met Arg Asn Lys Trp Lys Ser Phe Lys Glu Asn Pro Thr Asp Phe
        915                 920                 925

att tat tac cca tca gaa aaa gca aaa atc cta gcg gga aaa cta gaa   2832
Ile Tyr Tyr Pro Ser Glu Lys Ala Lys Ile Leu Ala Gly Lys Leu Glu
    930                 935                 940

ggt aag ctt aca acg cta caa aat ggt gaa tat gcc gaa cgt ggt aag   2880
Gly Lys Leu Thr Thr Leu Gln Asn Gly Glu Tyr Ala Glu Arg Gly Lys
945                 950                 955                 960

ttt gat gag agt atc caa att ggt aaa cac caa tta tcg cta cca tca   2928
Phe Asp Glu Ser Ile Gln Ile Gly Lys His Gln Leu Ser Leu Pro Ser
                965                 970                 975

gta gag ctt aaa gcg gag ttt agt gat aaa gaa cgt ttg gaa gag gac   2976
Val Glu Leu Lys Ala Glu Phe Ser Asp Lys Glu Arg Leu Glu Glu Asp
            980                 985                 990

ggg gta gat tta tcc tcg atc gcc gaa ctc tta gaa atg cca aac tta   3024
Gly Val Asp Leu Ser Ser Ile Ala Glu Leu Leu Glu Met Pro Asn Leu
        995                1000                1005

ttt att gat aat agt atc caa tta gaa aag aaa aag ttg tct cct att   3072
Phe Ile Asp Asn Ser Ile Gln Leu Glu Lys Lys Lys Leu Ser Pro Ile
   1010                1015                1020

gag gat cta gat gaa gaa cca cgt aaa aat ctg gat ata gaa gaa agc   3120
Glu Asp Leu Asp Glu Glu Pro Arg Lys Asn Leu Asp Ile Glu Glu Ser
1025                1030                1035                1040

cat tct aat tca tcg gat gac gtg ctt agc atg aat gat gat gag tct   3168
His Ser Asn Ser Ser Asp Asp Val Leu Ser Met Asn Asp Asp Glu Ser
                1045                1050                1055

gat aca gac gat agc aag tgg agt atg ggc aat gat gag aaa gag atg   3216
Asp Thr Asp Asp Ser Lys Trp Ser Met Gly Asn Asp Glu Lys Glu Met
            1060                1065                1070

ccc gat gat aag ctg ggt ata agt cgt gat gat cgt gga aat aaa cca   3264
Pro Asp Asp Lys Leu Gly Ile Ser Arg Asp Asp Arg Gly Asn Lys Pro
        1075                1080                1085

cct cgt act gat cct aca gtt gat tat ctt aac cct gat gaa ttc ttt   3312
Pro Arg Thr Asp Pro Thr Val Asp Tyr Leu Asn Pro Asp Glu Phe Phe
   1090                1095                1100

gaa aat ggt tat ctc ttg aat gag cta cta cag gag ctt gga gaa gag   3360
Glu Asn Gly Tyr Leu Leu Asn Glu Leu Leu Gln Glu Leu Gly Glu Glu
1105                1110                1115                1120


ccg tta cta aaa gaa ggg gaa gat cat ttt aaa cgt tct acc aat cta   3408
Pro Leu Leu Lys Glu Gly Glu Asp His Phe Lys Arg Ser Thr Asn Leu
                1125                1130                1135

gtc cgt cta ggc gag aga gat agg caa aat aga gaa aag aga gaa aaa   3456
Val Arg Leu Gly Glu Arg Asp Arg Gln Asn Arg Glu Lys Arg Glu Lys
            1140                1145                1150

gag ggg tat ttt gat ctg cct ggt aca tta gat atg aaa ctg cag gag   3504
Glu Gly Tyr Phe Asp Leu Pro Gly Thr Leu Asp Met Lys Leu Gln Glu
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       1155                1160                1165

tta ttc gaa aaa aga aaa caa aaa cac gaa gca gaa cag aaa gca aga   3552
Leu Phe Glu Lys Arg Lys Gln Lys His Glu Ala Glu Gln Lys Ala Arg
   1170                1175                1180

ata gaa aaa gca ctt cta caa aaa tca gaa caa caa gaa aaa cgt gtt   3600
Ile Glu Lys Ala Leu Leu Gln Lys Ser Glu Gln Gln Glu Lys Arg Val
1185                1190                1195                1200

gaa gaa cgt aag caa gag gaa aaa cgt caa gcg caa gat aaa att gct   3648
Glu Glu Arg Lys Gln Glu Glu Lys Arg Gln Ala Gln Asp Lys Ile Ala
               1205                1210                1215

aag caa gta gaa att gca aaa gaa atg caa cgg gta gaa gaa att cgc   3696
Lys Gln Val Glu Ile Ala Lys Glu Met Gln Arg Val Glu Glu Ile Arg
          1220                1225                1230

cag aga gaa aaa caa ctt gcg atc caa ctg caa gaa gaa gag aag aaa   3744
Gln Arg Glu Lys Gln Leu Ala Ile Gln Leu Gln Glu Glu Glu Lys Lys
       1235                1240                1245

caa caa gaa gaa aaa cat tta tcc gag gag aaa aaa caa gct gaa cag   3792
Gln Gln Glu Glu Lys His Leu Ser Glu Glu Lys Lys Gln Ala Glu Gln
   1250                1255                1260

aaa caa aaa gct gag gag aaa gtt gca caa gaa aga tta gac att gaa   3840
Lys Gln Lys Ala Glu Glu Lys Val Ala Gln Glu Arg Leu Asp Ile Glu
1265                1270                1275                1280

caa cag aaa gcg tat gaa gaa atg gcg aag cga gag gca gag gca tca   3888
Gln Gln Lys Ala Tyr Glu Glu Met Ala Lys Arg Glu Ala Glu Ala Ser
               1285                1290                1295

aaa aat gtt tta ttg aaa gcg att gat gaa gaa cgt cca aaa gtg gaa   3936
Lys Asn Val Leu Leu Lys Ala Ile Asp Glu Glu Arg Pro Lys Val Glu
          1300                1305                1310

act gat cca ctt ttc cgt aca aaa ttg aaa tat atc aat caa gat gac   3984
Thr Asp Pro Leu Phe Arg Thr Lys Leu Lys Tyr Ile Asn Gln Asp Asp
       1315                1320                1325

tat gct ggt gca aat tat ttc ttc aat aaa gtt ggt tta aat aca aaa   4032
Tyr Ala Gly Ala Asn Tyr Phe Phe Asn Lys Val Gly Leu Asn Thr Lys
   1330                1335                1340

ggt cat caa aaa gta aat gtg tta ggg gat aac tat ttt gat cat caa   4080
Gly His Gln Lys Val Asn Val Leu Gly Asp Asn Tyr Phe Asp His Gln
1345                1350                1355                1360


gtg att act cgc tcg att gag aaa aaa gta gat aac cac ctt aac caa   4128
Val Ile Thr Arg Ser Ile Glu Lys Lys Val Asp Asn His Leu Asn Gln
               1365                1370                1375

aaa tac aat ctc agc gat gtg gaa tta gtt aaa cag ctg atg gac aat   4176
Lys Tyr Asn Leu Ser Asp Val Glu Leu Val Lys Gln Leu Met Asp Asn
          1380                1385                1390

tcc aca aca caa gcg cag gag ttg gat ttg aaa cta ggt gcg gca tta   4224
Ser Thr Thr Gln Ala Gln Glu Leu Asp Leu Lys Leu Gly Ala Ala Leu
       1395                1400                1405
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act aaa gaa caa caa gct aac ttg acc caa gat atc gtt tgg tat gtc   4272
Thr Lys Glu Gln Gln Ala Asn Leu Thr Gln Asp Ile Val Trp Tyr Val
   1410                1415                1420

aaa acg aag gta aag ggc aaa gat gtg ttt gtt cca aag gtt tat ttc   4320
Lys Thr Lys Val Lys Gly Lys Asp Val Phe Val Pro Lys Val Tyr Phe
1425                1430                1435                1440

gct tct gaa acg ctc gta gaa gcc caa aaa tta caa ggt tta ggc act   4368
Ala Ser Glu Thr Leu Val Glu Ala Gln Lys Leu Gln Gly Leu Gly Thr
               1445                1450                1455

ggg act atc aga gtt ggt gaa gct aag att aaa gcc aaa gat gtg gtg   4416
Gly Thr Ile Arg Val Gly Glu Ala Lys Ile Lys Ala Lys Asp Val Val
           1460                1465                1470

aat acc ggg aca tta gct ggg aga aaa ctc aat gtt gaa gcg agt aat   4464
Asn Thr Gly Thr Leu Ala Gly Arg Lys Leu Asn Val Glu Ala Ser Asn
       1475                1480                1485

aaa atc aaa aat caa ggg agt atc tta agt act caa gaa aca cgt tta   4512
Lys Ile Lys Asn Gln Gly Ser Ile Leu Ser Thr Gln Glu Thr Arg Leu
   1490                1495                1500

gtc ggg cgt aaa ggt att gaa aac gta tct cgt tca ttt gca aat gat   4560
Val Gly Arg Lys Gly Ile Glu Asn Val Ser Arg Ser Phe Ala Asn Asp
1505                1510                1515                1520

gaa tta gga gtc act gca caa cgc tca gaa atc aaa acg gaa ggt cat   4608
Glu Leu Gly Val Thr Ala Gln Arg Ser Glu Ile Lys Thr Glu Gly His
               1525                1530                1535

tta cat ctt gaa aca gat aag gat tca act att gat gta caa gca tcg   4656
Leu His Leu Glu Thr Asp Lys Asp Ser Thr Ile Asp Val Gln Ala Ser
           1540                1545                1550

gat att aaa gca aaa aca agc ttt gtg aag act ggt gat gtg aat ctc   4704
Asp Ile Lys Ala Lys Thr Ser Phe Val Lys Thr Gly Asp Val Asn Leu
       1555                1560                1565

aaa aat aca tac aat act aaa cat gcc tac cgt gag aaa ttc tcg ccg   4752
Lys Asn Thr Tyr Asn Thr Lys His Ala Tyr Arg Glu Lys Phe Ser Pro
   1570                1575                1580

agt gca cta caa gtt gca gaa ctt gat gtg gca ggg ctt aaa gtc cca   4800
Ser Ala Leu Gln Val Ala Glu Leu Asp Val Ala Gly Leu Lys Val Pro
1585                1590                1595                1600


ctt tta ggc gtg tcc gtc tcc atc cag ttt att cag agc ata cta gtg   4848
Leu Leu Gly Val Ser Val Ser Ile Gln Phe Ile Gln Ser Ile Leu Val
               1605                1610                1615

agg caa ctt caa gag gga tca atc ttc gaa gta ggg cac tta cat ntt   4896
Arg Gln Leu Gln Glu Gly Ser Ile Phe Glu Val Gly His Leu His Xaa
           1620                1625                1630

gcg gta gac aga aga tgt gaa cca agc ggg gag ta                   4931
Ala Val Asp Arg Arg Cys Glu Pro Ser Gly Glu
       1635                1640
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<211> 1643
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<213> Pasteurella multocida

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<221> misc_feature
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<223> Xaa = any or unknown amino acid

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Met Asn Lys Asn Arg Tyr Lys Leu Ile Phe Ser Gln Val Lys Gly Cys
1 5 10 15

Leu Val Pro Val Ala Glu Cys Ile Asn Ser Ala Ile Ser Asn Gly Ser
20 25 30

Ser Asp Ser Thr Ser Thr Ser Glu Gln Val Glu Glu Pro Phe Leu
35 40 45

Leu Glu Gln Tyr Ser Leu Ser Ser Val Ser Leu Leu Val Lys Ser Thr
50 55 60

Phe Asn Pro Val Ser Tyr Ala Met Gln Leu Thr Trp Lys Gln Leu Ser
65 70 75 80

Ile Leu Phe Leu Thr Val Ile Ser Val Pro Val Leu Ala Glu Gly Lys
85 90 95

Gly Asp Glu Arg Asn Gln Leu Thr Val Ile Asp Asn Ser Asp His Ile
100 105 110

Lys Leu Asp Ala Ser Asn Leu Ala Gly Asn Asp Lys Thr Lys Ile Tyr
115 120 125

Gln Ala Glu Asn Lys Val Leu Val Ile Asp Ile Ala Lys Pro Asn Gly
130 135 140

Lys Gly Ile Ser Asp Asn Arg Phe Glu Lys Phe Asn Ile Pro Asn Ser
145 150 155 160

Ala Val Phe Asn Asn Asn Gly Thr Glu Ala Gln Ala Arg Ser Thr Leu
165 170 175

Ile Gly Tyr Ile Pro Gln Asn Gln Asn Leu Arg Gly Gly Lys Glu Ala
180 185 190

Asp Val Ile Leu Asn Gln Val Thr Gly Pro Gln Glu Ser Lys Ile Val
195 200 205

Gly Ala Leu Glu Val Leu Gly Lys Lys Ala Asp Ile Val Ile Ala Asn
210 215 220

Gln Asn Gly Ile Thr Leu Asn Gly Val Arg Thr Ile Asn Ser Asp Arg
225 230 235 240

Phe Val Ala Thr Thr Ser Glu Leu Ile Asp Pro Asn Gln Met Met Leu
245 250 255

Lys Val Thr Lys Gly Asn Val Ile Ile Asp Ile Asp Gly Phe Ser Thr
260 265 270

Asp Gly Leu Lys Tyr Leu Asp Ile Ile Ala Lys Lys Ile Glu Gln Lys

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        275                 280                 285

Gln Ser Ile Thr Ser Gly Asp Asn Ser Glu Ala Lys Thr Asp Val Thr
    290                 295                 300

Leu Ile Ala Gly Ser Ser Glu Tyr Asp Leu Ser Lys His Glu Leu Lys
305                 310                 315                 320

Lys Thr Ser Gly Glu Asn Val Ser Asn Asp Val Ile Ala Ile Thr Gly
                325                 330                 335

Ser Ser Thr Gly Ala Met His Gly Lys Asn Ile Lys Leu Ile Val Thr
            340                 345                 350

Asp Lys Gly Ala Gly Val Lys His Asp Gly Ile Ile Leu Ser Glu Asn
        355                 360                 365

Asp Ile Gln Ile Glu Met Asn Glu Gly Asp Leu Glu Leu Gly Asn Thr
    370                 375                 380

Ile Gln Gln Thr Val Val Lys Lys Asp Arg Asn Ile Arg Ala Lys Lys
385                 390                 395                 400

Lys Ile Glu Val Lys Asn Ala Asn Arg Val Phe Val Gly Ser Gln Thr
                405                 410                 415

Lys Ser Asp Glu Ile Ser Leu Glu Ala Lys Gln Val Lys Ile Arg Lys
            420                 425                 430

Asn Ala Glu Ile Arg Ser Thr Thr Gln Ala Lys Ile Val Ala Lys Gly
        435                 440                 445

Ala Leu Ser Ile Glu Gln Asn Ala Lys Leu Val Ala Lys Lys Ile Asp
    450                 455                 460

Val Ala Thr Glu Thr Leu Thr Asn Ala Gly Arg Ile Tyr Gly Arg Glu
465                 470                 475                 480

Val Lys Leu Asp Thr Asn Asn Leu Ile Asn Asp Lys Glu Ile Tyr Ala
                485                 490                 495

Glu Arg Lys Leu Ser Ile Leu Thr Lys Gly Lys Asp Leu Glu Ile Ile
            500                 505                 510

Gln Asp Arg Tyr Leu Ser Pro Leu Met Arg Val Lys Ser Ser Val Arg
        515                 520                 525

Phe Leu Gly Ser Pro Phe Phe Ser Ile Ser Pro Ser Met Leu Ala Ser
    530                 535                 540

Leu Ser Ala Gln Phe Lys Pro Gly Phe Val Asn Lys Gly Leu Ile Glu
545                 550                 555                 560

Ser Ala Gly Ser Ala Glu Leu Thr Phe Lys Glu Lys Thr Ser Phe Leu
                565                 570                 575

Thr Glu Gly Asn Asn Phe Ile Arg Ala Lys Asp Ala Leu Thr Ile Asn
            580                 585                 590

Ala Gln Asn Ile Glu Ile Asp Lys Asn Gln Asp Ile Gln Leu Gly Ala
        595                 600                 605
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Asn Ile Thr Leu Asn Val Glu Glu Asn Phe Val Asn Arg Ala Gly Thr
    610                 615                 620

Leu Ala Thr Gly Lys Thr Leu Thr Ile Asn Thr Glu Ser Gly Ser Ile
625                 630                 635                 640

Tyr Asn Leu Gly Gly Thr Leu Gly Ala Gly Lys Ser Leu Lys Leu Thr
                645                 650                 655

Ala Lys Ser Thr Glu Glu Gly Met Gly Asn Ile Val Asn Gln Glu Asn
            660                 665                 670

Gly Leu Phe His Thr Leu Gly Asn Met Met Leu Glu Ala Glu Arg Ser
        675                 680                 685

Val Tyr Asn Ile Gly Asp Ile Tyr Ala Ser Lys Lys Leu Thr Val His
    690                 695                 700

Thr His Asn Leu Ile Asn Asp Val Arg Leu Ser Gly Asn Val Ser Tyr
705                 710                 715                 720

Lys Pro Ile Gly Ser Ser Arg Asp Tyr Asp Ile Ser Arg Val Ala Val
                725                 730                 735

His Gly Trp His Asn Asn Val Tyr Lys Leu Asn Leu Asn Leu Gln Glu
            740                 745                 750

Gln Asp Lys Thr Asp Ile Lys Val Val Lys Met Gly Ala Ile Arg Ser
        755                 760                 765

Asp Gly Asp Phe Asp Phe Lys Gly Ile Lys Ala Thr Ser Ser Glu Ser
    770                 775                 780

Lys Pro Gln Leu Ile Asn His Gly Leu Ile Asn Val Lys Gly Thr Phe
785                 790                 795                 800

Asn Ala Glu Ala Asp Gln Val Val Asn Gln Met Lys Ala Phe Asn Gln
                805                 810                 815

Asn Ala Leu Ala Ser Val Phe Lys Asn Pro Ala Lys Ile Thr Met Tyr
            820                 825                 830

Tyr Gln Pro Leu Thr Arg Tyr Ile Trp Thr Pro Leu Ser Gly Asn Ala
        835                 840                 845

Ser Arg Glu Phe Asn Asn Leu Glu Ser Phe Leu Asp Ala Leu Phe Gly
    850                 855                 860

Ser Thr Thr Ile Leu Lys Ser Ser Phe Tyr Ser Thr Glu Asn Phe Ser
865                 870                 875                 880

Ala Tyr Gln Leu Leu Ser His Ile Gln His Ser Pro Met Tyr Gln Lys
                885                 890                 895

Ala Met Ala Gln Val Phe Gly Ala Glu Trp His Ser Lys Ser Tyr Asp
            900                 905                 910

Glu Met Arg Asn Lys Trp Lys Ser Phe Lys Glu Asn Pro Thr Asp Phe
        915                 920                 925

Ile Tyr Tyr Pro Ser Glu Lys Ala Lys Ile Leu Ala Gly Lys Leu Glu
    930                 935                 940
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Gly Lys Leu Thr Thr Leu Gln Asn Gly Glu Tyr Ala Glu Arg Gly Lys
945                 950                 955                 960

Phe Asp Glu Ser Ile Gln Ile Gly Lys His Gln Leu Ser Leu Pro Ser
                965                 970                 975

Val Glu Leu Lys Ala Glu Phe Ser Asp Lys Glu Arg Leu Glu Glu Asp
            980                 985                 990

Gly Val Asp Leu Ser Ser Ile Ala Glu Leu Leu Glu Met Pro Asn Leu
        995                1000                1005

Phe Ile Asp Asn Ser Ile Gln Leu Glu Lys Lys Lys Leu Ser Pro Ile
   1010                1015                1020

Glu Asp Leu Asp Glu Glu Pro Arg Lys Asn Leu Asp Ile Glu Glu Ser
1025                1030                1035                1040

His Ser Asn Ser Ser Asp Asp Val Leu Ser Met Asn Asp Asp Glu Ser
                1045                1050                1055

Asp Thr Asp Asp Ser Lys Trp Ser Met Gly Asn Asp Glu Lys Glu Met
            1060                1065                1070

Pro Asp Asp Lys Leu Gly Ile Ser Arg Asp Asp Arg Gly Asn Lys Pro
        1075                1080                1085

Pro Arg Thr Asp Pro Thr Val Asp Tyr Leu Asn Pro Asp Glu Phe Phe
   1090                1095                1100

Glu Asn Gly Tyr Leu Leu Asn Glu Leu Leu Gln Glu Leu Gly Glu Glu
1105                1110                1115                1120

Pro Leu Leu Lys Glu Gly Glu Asp His Phe Lys Arg Ser Thr Asn Leu
                1125                1130                1135

Val Arg Leu Gly Glu Arg Asp Arg Gln Asn Arg Glu Lys Arg Glu Lys
            1140                1145                1150

Glu Gly Tyr Phe Asp Leu Pro Gly Thr Leu Asp Met Lys Leu Gln Glu
        1155                1160                1165

Leu Phe Glu Lys Arg Lys Gln Lys His Glu Ala Glu Gln Lys Ala Arg
   1170                1175                1180

Ile Glu Lys Ala Leu Leu Gln Lys Ser Glu Gln Gln Glu Lys Arg Val
1185                1190                1195                1200

Glu Glu Arg Lys Gln Glu Glu Lys Arg Gln Ala Gln Asp Lys Ile Ala
                1205                1210                1215

Lys Gln Val Glu Ile Ala Lys Glu Met Gln Arg Val Glu Glu Ile Arg
            1220                1225                1230

Gln Arg Glu Lys Gln Leu Ala Ile Gln Leu Gln Glu Glu Glu Lys Lys
        1235                1240                1245

Gln Gln Glu Glu Lys His Leu Ser Glu Glu Lys Lys Gln Ala Glu Gln
   1250                1255                1260

Lys Gln Lys Ala Glu Glu Lys Val Ala Gln Glu Arg Leu Asp Ile Glu
1265                1270                1275                1280
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Gln Gln Lys Ala Tyr Glu Glu Met Ala Lys Arg Glu Ala Glu Ala Ser
                1285                1290                1295

Lys Asn Val Leu Leu Lys Ala Ile Asp Glu Glu Arg Pro Lys Val Glu
            1300                1305                1310

Thr Asp Pro Leu Phe Arg Thr Lys Leu Lys Tyr Ile Asn Gln Asp Asp
        1315                1320                1325

Tyr Ala Gly Ala Asn Tyr Phe Phe Asn Lys Val Gly Leu Asn Thr Lys
    1330                1335                1340

Gly His Gln Lys Val Asn Val Leu Gly Asp Asn Tyr Phe Asp His Gln
1345                1350                1355                1360

Val Ile Thr Arg Ser Ile Glu Lys Lys Val Asp Asn His Leu Asn Gln
                1365                1370                1375

Lys Tyr Asn Leu Ser Asp Val Glu Leu Val Lys Gln Leu Met Asp Asn
            1380                1385                1390

Ser Thr Thr Gln Ala Gln Glu Leu Asp Leu Lys Leu Gly Ala Ala Leu
        1395                1400                1405

Thr Lys Glu Gln Gln Ala Asn Leu Thr Gln Asp Ile Val Trp Tyr Val
    1410                1415                1420

Lys Thr Lys Val Lys Gly Lys Asp Val Phe Val Pro Lys Val Tyr Phe
1425                1430                1435                1440

Ala Ser Glu Thr Leu Val Glu Ala Gln Lys Leu Gln Gly Leu Gly Thr
                1445                1450                1455

Gly Thr Ile Arg Val Gly Glu Ala Lys Ile Lys Ala Lys Asp Val Val
            1460                1465                1470


Asn Thr Gly Thr Leu Ala Gly Arg Lys Leu Asn Val Glu Ala Ser Asn
        1475                1480                1485

Lys Ile Lys Asn Gln Gly Ser Ile Leu Ser Thr Gln Glu Thr Arg Leu
    1490                1495                1500

Val Gly Arg Lys Gly Ile Glu Asn Val Ser Arg Ser Phe Ala Asn Asp
1505                1510                1515                1520

Glu Leu Gly Val Thr Ala Gln Arg Ser Glu Ile Lys Thr Glu Gly His
                1525                1530                1535

Leu His Leu Glu Thr Asp Lys Asp Ser Thr Ile Asp Val Gln Ala Ser
            1540                1545                1550

Asp Ile Lys Ala Lys Thr Ser Phe Val Lys Thr Gly Asp Val Asn Leu
        1555                1560                1565

Lys Asn Thr Tyr Asn Thr Lys His Ala Tyr Arg Glu Lys Phe Ser Pro
    1570                1575                1580

Ser Ala Leu Gln Val Ala Glu Leu Asp Val Ala Gly Leu Lys Val Pro
1585                1590                1595                1600

Leu Leu Gly Val Ser Val Ser Ile Gln Phe Ile Gln Ser Ile Leu Val
                1605                1610                1615
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Arg Gln Leu Gln Glu Gly Ser Ile Phe Glu Val Gly His Leu His Xaa
            1620                1625                1630

Ala Val Asp Arg Arg Cys Glu Pro Ser Gly Glu
        1635                1640


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Ile Arg Gly Val Asp Lys Asp Arg Val Ala Val Ile Val Asp Gly Ile
  1               5                  10                  15

ccg cag gct gaa tcg act ata tct act tcc gca cgt tat tcg act gaa   96
Pro Gln Ala Glu Ser Thr Ile Ser Thr Ser Ala Arg Tyr Ser Thr Glu
             20                  25                  30

cgt cat aat ggt aat att aat aat att gaa tac gaa aat gtt agt tcg   144
Arg His Asn Gly Asn Ile Asn Asn Ile Glu Tyr Glu Asn Val Ser Ser
         35                  40                  45


ttg aaa gtt caa aaa ggg gca gct tct gta atg tat ggt agc ggt gcg   192
Leu Lys Val Gln Lys Gly Ala Ala Ser Val Met Tyr Gly Ser Gly Ala
     50                  55                  60

tta ggt gga acc gtg gag ttt acc aca aaa gat att gag gac ttt gtc   240
Leu Gly Gly Thr Val Glu Phe Thr Thr Lys Asp Ile Glu Asp Phe Val
 65                  70                  75                  80

gaa cct ggt cgc cat ttg ggc ttt ttg tct aaa acc ggc tat act tca   288
Glu Pro Gly Arg His Leu Gly Phe Leu Ser Lys Thr Gly Tyr Thr Ser
                 85                  90                  95

aaa aac aga gaa tat cgt caa gtc atc gga gtt gga ggg aaa ggg gaa   336
Lys Asn Arg Glu Tyr Arg Gln Val Ile Gly Val Gly Gly Lys Gly Glu
            100                 105                 110

cac ttt ttt ggt ttt gta caa tta acc aaa cgt tgg ggg cat gaa aca   384
His Phe Phe Gly Phe Val Gln Leu Thr Lys Arg Trp Gly His Glu Thr
        115                 120                 125

atc aac aac ggc aaa ggt aca gac att ctc ggc gaa cat cga ggt aaa   432
Ile Asn Asn Gly Lys Gly Thr Asp Ile Leu Gly Glu His Arg Gly Lys
    130                 135                 140

ccc aat ccg ctc aac tac tat act aca tca tgg tta acg aaa gtc ggt   480
Pro Asn Pro Leu Asn Tyr Tyr Thr Thr Ser Trp Leu Thr Lys Val Gly
145                 150                 155                 160

tac gat att aat aac act cat cgt ttt aca ctg ttt tta gaa gat cgc   528
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Tyr Asp Ile Asn Asn Thr His Arg Phe Thr Leu Phe Leu Glu Asp Arg
                165                 170                 175

cgt gaa aag aag ctt acc gaa gaa aaa aca tta ggg ctt agt gat gca   576
Arg Glu Lys Lys Leu Thr Glu Glu Lys Thr Leu Gly Leu Ser Asp Ala
            180                 185                 190

gtg cgt ttt gct aat gat caa acc cct tat ctc cgt tat ggt att gaa   624
Val Arg Phe Ala Asn Asp Gln Thr Pro Tyr Leu Arg Tyr Gly Ile Glu
        195                 200                 205

tat cga tat aac ggc ttg tct tgg ttg gaa acg gta aag ctt ttt ttg   672
Tyr Arg Tyr Asn Gly Leu Ser Trp Leu Glu Thr Val Lys Leu Phe Leu
    210                 215                 220

gca aag cag aaa atc gaa caa cgt tct gct ctc caa gag ttt gat att   720
Ala Lys Gln Lys Ile Glu Gln Arg Ser Ala Leu Gln Glu Phe Asp Ile
225                 230                 235                 240

aat aat agg aat aaa ttg gat tcg act atg tcg ttt gta tat tta caa   768
Asn Asn Arg Asn Lys Leu Asp Ser Thr Met Ser Phe Val Tyr Leu Gln
                245                 250                 255

aga cag aat ata gct cgg gga gaa ttt tca acg agt cct tta tat tgg   816
Arg Gln Asn Ile Ala Arg Gly Glu Phe Ser Thr Ser Pro Leu Tyr Trp
            260                 265                 270

ggg ccg agt cgc cat cgt tta tct gcg aaa ttc gaa ttt cgt gat aag   864
Gly Pro Ser Arg His Arg Leu Ser Ala Lys Phe Glu Phe Arg Asp Lys
        275                 280                 285


ttt tta gaa aat atg aat aag cat ttt acg ttt cgg ccg tgg caa atc   912
Phe Leu Glu Asn Met Asn Lys His Phe Thr Phe Arg Pro Trp Gln Ile
    290                 295                 300

aat aga ttc aga caa caa ggt cga aat aac tat aca gaa gtg ttt ccc   960
Asn Arg Phe Arg Gln Gln Gly Arg Asn Asn Tyr Thr Glu Val Phe Pro
305                 310                 315                 320

gtt aaa tcc cga gag ttt tct ttt tct ctt atg gac gac att aag att  1008
Val Lys Ser Arg Glu Phe Ser Phe Ser Leu Met Asp Asp Ile Lys Ile
                325                 330                 335

ggc gaa ttg cta cat ctc gga ttg ggc ggt cgg tgg gat cac tat aac  1056
Gly Glu Leu Leu His Leu Gly Leu Gly Gly Arg Trp Asp His Tyr Asn
            340                 345                 350

tat aag cca tta tta aat tct cag cat aat atc aac agg aca cag aga  1104
Tyr Lys Pro Leu Leu Asn Ser Gln His Asn Ile Asn Arg Thr Gln Arg
        355                 360                 365

tta cct tat cca aaa aca tca tcc aaa ttt tcg tat caa ttg agt tta  1152
Leu Pro Tyr Pro Lys Thr Ser Ser Lys Phe Ser Tyr Gln Leu Ser Leu
    370                 375                 380

gag tat caa tta cat cca tca cat caa att gca tac cgt tta agt acc  1200
Glu Tyr Gln Leu His Pro Ser His Gln Ile Ala Tyr Arg Leu Ser Thr
385                 390                 395                 400

ggt ttt agg gtt ccc cgt gtt gaa gat ctt tat ttt gaa gac cga gga  1248
Gly Phe Arg Val Pro Arg Val Glu Asp Leu Tyr Phe Glu Asp Arg Gly
                405                 410                 415
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aaa agt tct tca caa ttt ctt cct aac ccc gat cta caa ccg gaa act   1296
Lys Ser Ser Ser Gln Phe Leu Pro Asn Pro Asp Leu Gln Pro Glu Thr
            420                 425                 430

gca ctg aat cat gaa ata agt tac cgt ttc caa aat caa tat gcc cat   1344
Ala Leu Asn His Glu Ile Ser Tyr Arg Phe Gln Asn Gln Tyr Ala His
        435                 440                 445

ttc agc gtc ggg ctt ttc cgt aca cgt tat cat aac ttt att caa gaa   1392
Phe Ser Val Gly Leu Phe Arg Thr Arg Tyr His Asn Phe Ile Gln Glu
    450                 455                 460

cgt gag atg acc tgt gat aaa att cca tat gag tat aat agg act tat   1440
Arg Glu Met Thr Cys Asp Lys Ile Pro Tyr Glu Tyr Asn Arg Thr Tyr
465                 470                 475                 480

gga tat tgc acg cat aat act tat gta atg ttt gtt aat gaa cct gaa   1488
Gly Tyr Cys Thr His Asn Thr Tyr Val Met Phe Val Asn Glu Pro Glu
                485                 490                 495

gcc gtg att aaa ggg gtt gaa gta agc ggt gct tta aat ggg tcg gca   1536
Ala Val Ile Lys Gly Val Glu Val Ser Gly Ala Leu Asn Gly Ser Ala
            500                 505                 510

ttc gga ctt tcc gac ggt tta act ttc cgt ctc aaa ggg agc tac agc   1584
Phe Gly Leu Ser Asp Gly Leu Thr Phe Arg Leu Lys Gly Ser Tyr Ser
        515                 520                 525


aaa ggt caa aat cat gac ggc gat ccg tta aaa tct att caa cca tgg   1632
Lys Gly Gln Asn His Asp Gly Asp Pro Leu Lys Ser Ile Gln Pro Trp
    530                 535                 540

aca gtg gta acc ggt att gat tac gaa act gaa ggg tgg agc gtg agt   1680
Thr Val Val Thr Gly Ile Asp Tyr Glu Thr Glu Gly Trp Ser Val Ser
545                 550                 555                 560

ttg agc ggg cgt tat agt gcg gct aaa aaa gcc aaa gat gcg ata gaa   1728
Leu Ser Gly Arg Tyr Ser Ala Ala Lys Lys Ala Lys Asp Ala Ile Glu
                565                 570                 575

acg gaa tac aca cat gat aaa aag gtt gtc aaa caa tgg ccg cat tta   1776
Thr Glu Tyr Thr His Asp Lys Lys Val Val Lys Gln Trp Pro His Leu
            580                 585                 590

agt cca tcc tac ttt gtt gtt gat ttt acg ggg caa gtt aac ctc agt   1824
Ser Pro Ser Tyr Phe Val Val Asp Phe Thr Gly Gln Val Asn Leu Ser
        595                 600                 605

aaa aat gtc att ttg aat atg ggg gta ttt aac ttg ttc aat cgt gat   1872
Lys Asn Val Ile Leu Asn Met Gly Val Phe Asn Leu Phe Asn Arg Asp
    610                 615                 620

tat atg acg tgg gac agt gca tat aac ttg ttt act agg ggg tat act   1920
Tyr Met Thr Trp Asp Ser Ala Tyr Asn Leu Phe Thr Arg Gly Tyr Thr
625                 630                 635                 640

tcc cgt tct gtc cgt gct aac agc cca ggc att aat cgg ttt acc gca   1968
Ser Arg Ser Val Arg Ala Asn Ser Pro Gly Ile Asn Arg Phe Thr Ala
                645                 650                 655

cca aaa cgt aat ttt gct gcc tcg gtg gaa att cgt ttt ta            2009
Pro Lys Arg Asn Phe Ala Ala Ser Val Glu Ile Arg Phe
```

660 665

<210> 105
<211> 669
<212> PRT
<213> Pasteurella multocida

<400> 105
Ile Arg Gly Val Asp Lys Asp Arg Val Ala Val Ile Val Asp Gly Ile
1 5 10 15

Pro Gln Ala Glu Ser Thr Ile Ser Thr Ser Ala Arg Tyr Ser Thr Glu
20 25 30

Arg His Asn Gly Asn Ile Asn Asn Ile Glu Tyr Glu Asn Val Ser Ser
35 40 45

Leu Lys Val Gln Lys Gly Ala Ala Ser Val Met Tyr Gly Ser Gly Ala
50 55 60

Leu Gly Gly Thr Val Glu Phe Thr Thr Lys Asp Ile Glu Asp Phe Val
65 70 75 80

Glu Pro Gly Arg His Leu Gly Phe Leu Ser Lys Thr Gly Tyr Thr Ser
85 90 95

Lys Asn Arg Glu Tyr Arg Gln Val Ile Gly Val Gly Gly Lys Gly Glu
100 105 110

His Phe Phe Gly Phe Val Gln Leu Thr Lys Arg Trp Gly His Glu Thr
115 120 125

Ile Asn Asn Gly Lys Gly Thr Asp Ile Leu Gly Glu His Arg Gly Lys
130 135 140

Pro Asn Pro Leu Asn Tyr Tyr Thr Thr Ser Trp Leu Thr Lys Val Gly
145 150 155 160

Tyr Asp Ile Asn Asn Thr His Arg Phe Thr Leu Phe Leu Glu Asp Arg
165 170 175

Arg Glu Lys Lys Leu Thr Glu Glu Lys Thr Leu Gly Leu Ser Asp Ala
180 185 190

Val Arg Phe Ala Asn Asp Gln Thr Pro Tyr Leu Arg Tyr Gly Ile Glu
195 200 205

Tyr Arg Tyr Asn Gly Leu Ser Trp Leu Glu Thr Val Lys Leu Phe Leu
210 215 220

Ala Lys Gln Lys Ile Glu Gln Arg Ser Ala Leu Gln Glu Phe Asp Ile
225 230 235 240

Asn Asn Arg Asn Lys Leu Asp Ser Thr Met Ser Phe Val Tyr Leu Gln
245 250 255

Arg Gln Asn Ile Ala Arg Gly Glu Phe Ser Thr Ser Pro Leu Tyr Trp
260 265 270

Gly Pro Ser Arg His Arg Leu Ser Ala Lys Phe Glu Phe Arg Asp Lys
275 280 285

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Phe Leu Glu Asn Met Asn Lys His Phe Thr Phe Arg Pro Trp Gln Ile
    290                 295                 300

Asn Arg Phe Arg Gln Gln Gly Arg Asn Asn Tyr Thr Glu Val Phe Pro
305                 310                 315                 320

Val Lys Ser Arg Glu Phe Ser Phe Ser Leu Met Asp Asp Ile Lys Ile
                325                 330                 335

Gly Glu Leu Leu His Leu Gly Leu Gly Gly Arg Trp Asp His Tyr Asn
            340                 345                 350

Tyr Lys Pro Leu Leu Asn Ser Gln His Asn Ile Asn Arg Thr Gln Arg
        355                 360                 365

Leu Pro Tyr Pro Lys Thr Ser Ser Lys Phe Ser Tyr Gln Leu Ser Leu
    370                 375                 380

Glu Tyr Gln Leu His Pro Ser His Gln Ile Ala Tyr Arg Leu Ser Thr
385                 390                 395                 400

Gly Phe Arg Val Pro Arg Val Glu Asp Leu Tyr Phe Glu Asp Arg Gly
                405                 410                 415

Lys Ser Ser Ser Gln Phe Leu Pro Asn Pro Asp Leu Gln Pro Glu Thr
            420                 425                 430

Ala Leu Asn His Glu Ile Ser Tyr Arg Phe Gln Asn Gln Tyr Ala His
        435                 440                 445

Phe Ser Val Gly Leu Phe Arg Thr Arg Tyr His Asn Phe Ile Gln Glu
    450                 455                 460

Arg Glu Met Thr Cys Asp Lys Ile Pro Tyr Glu Tyr Asn Arg Thr Tyr
465                 470                 475                 480

Gly Tyr Cys Thr His Asn Thr Tyr Val Met Phe Val Asn Glu Pro Glu
                485                 490                 495

Ala Val Ile Lys Gly Val Glu Val Ser Gly Ala Leu Asn Gly Ser Ala
            500                 505                 510

Phe Gly Leu Ser Asp Gly Leu Thr Phe Arg Leu Lys Gly Ser Tyr Ser
        515                 520                 525

Lys Gly Gln Asn His Asp Gly Asp Pro Leu Lys Ser Ile Gln Pro Trp
    530                 535                 540

Thr Val Val Thr Gly Ile Asp Tyr Glu Thr Glu Gly Trp Ser Val Ser
545                 550                 555                 560

Leu Ser Gly Arg Tyr Ser Ala Ala Lys Lys Ala Lys Asp Ala Ile Glu
                565                 570                 575

Thr Glu Tyr Thr His Asp Lys Lys Val Val Lys Gln Trp Pro His Leu
            580                 585                 590

Ser Pro Ser Tyr Phe Val Val Asp Phe Thr Gly Gln Val Asn Leu Ser
        595                 600                 605

Lys Asn Val Ile Leu Asn Met Gly Val Phe Asn Leu Phe Asn Arg Asp
    610                 615                 620
```

```
Tyr Met Thr Trp Asp Ser Ala Tyr Asn Leu Phe Thr Arg Gly Tyr Thr
625                 630                 635                 640

Ser Arg Ser Val Arg Ala Asn Ser Pro Gly Ile Asn Arg Phe Thr Ala
                645                 650                 655

Pro Lys Arg Asn Phe Ala Ala Ser Val Glu Ile Arg Phe
            660                 665


<210> 106
<211> 908
<212> DNA
<213> Pasteurella multocida

<220>
<223> lgtC

<220>
<221> CDS
<222> (1)..(906)

<400> 106
atg aat att tta ttt gtt tct gat gat gtt tat gct aaa cat ctg gtg   48
Met Asn Ile Leu Phe Val Ser Asp Asp Val Tyr Ala Lys His Leu Val
  1               5                  10                  15

gtt gcg att aaa agc att ata aat cat aat gaa aaa ggt att tca ttt   96
Val Ala Ile Lys Ser Ile Ile Asn His Asn Glu Lys Gly Ile Ser Phe
            20                  25                  30

tat att ttt gat ttg ggt ata aag gat gaa aat aag aga aat att aat   144
Tyr Ile Phe Asp Leu Gly Ile Lys Asp Glu Asn Lys Arg Asn Ile Asn
        35                  40                  45

gat att gtt tct tct tat gga agt gaa gtc aac ttt att gct gtg aat   192
Asp Ile Val Ser Ser Tyr Gly Ser Glu Val Asn Phe Ile Ala Val Asn
    50                  55                  60

gag aaa gaa ttt gag agt ttt cct gtt caa att agt tat att tct tta   240
Glu Lys Glu Phe Glu Ser Phe Pro Val Gln Ile Ser Tyr Ile Ser Leu
65                  70                  75                  80

gca aca tat gca agg cta aaa gcg gca gag tat ttg ccg gat aat tta   288
Ala Thr Tyr Ala Arg Leu Lys Ala Ala Glu Tyr Leu Pro Asp Asn Leu
                85                  90                  95

aat aaa att att tat tta gat gtt gat gtt ttg gtt ttt aac tca tta   336
Asn Lys Ile Ile Tyr Leu Asp Val Asp Val Leu Val Phe Asn Ser Leu
            100                 105                 110

gaa atg tta tgg aat gtt gat gtt aat aat ttt ctt acc gca gcc tgt   384
Glu Met Leu Trp Asn Val Asp Val Asn Asn Phe Leu Thr Ala Ala Cys
        115                 120                 125

tat gat tct ttc atc gaa aat gaa aag tct gag cat aaa aaa tcg att   432
Tyr Asp Ser Phe Ile Glu Asn Glu Lys Ser Glu His Lys Lys Ser Ile
    130                 135                 140

tca atg tca gat aag gaa tat tat ttt aat gca gga gta atg cta ttt   480
Ser Met Ser Asp Lys Glu Tyr Tyr Phe Asn Ala Gly Val Met Leu Phe
145                 150                 155                 160
```

```
aat tta gat gaa tgg cgg aag atg gat gta ttc tca aga gct tta gac   528
Asn Leu Asp Glu Trp Arg Lys Met Asp Val Phe Ser Arg Ala Leu Asp
                165                 170                 175

ctg tta gct atg tat cct aat caa atg att tat cag gat caa gat ata   576
Leu Leu Ala Met Tyr Pro Asn Gln Met Ile Tyr Gln Asp Gln Asp Ile
            180                 185                 190

ttg aat atc ctt ttt agg aat aaa gtc tgt tat tta gat tgc aga ttt   624
Leu Asn Ile Leu Phe Arg Asn Lys Val Cys Tyr Leu Asp Cys Arg Phe
        195                 200                 205

aat ttc atg cca aat caa ctt gaa aga ata aaa caa tac cat aaa gga   672
Asn Phe Met Pro Asn Gln Leu Glu Arg Ile Lys Gln Tyr His Lys Gly
    210                 215                 220

aaa ttg agc aac tta cat tct tta gaa aaa aca acg atg cct gtc gtt   720
Lys Leu Ser Asn Leu His Ser Leu Glu Lys Thr Thr Met Pro Val Val
225                 230                 235                 240

att tca cat tat tgt ggt cca gaa aaa gcg tgg cat gcg gat tgt aaa   768
Ile Ser His Tyr Cys Gly Pro Glu Lys Ala Trp His Ala Asp Cys Lys
                245                 250                 255

cat ttt aat gta tat ttc tat cag aaa ata tta gca gaa ata acg aga   816
His Phe Asn Val Tyr Phe Tyr Gln Lys Ile Leu Ala Glu Ile Thr Arg
            260                 265                 270

ggc acg gat aaa gaa cgc gta tta tct ata aaa act tat ctc aag gcc   864
Gly Thr Asp Lys Glu Arg Val Leu Ser Ile Lys Thr Tyr Leu Lys Ala
        275                 280                 285

ttg att aga agg att aga tat aaa ttc aaa tat caa gtc tat ta        908
Leu Ile Arg Arg Ile Arg Tyr Lys Phe Lys Tyr Gln Val Tyr
    290                 295                 300
```

<210> 107
<211> 302
<212> PRT
<213> Pasteurella multocida

<400> 107

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Met Asn Ile Leu Phe Val Ser Asp Asp Val Tyr Ala Lys His Leu Val
  1               5                  10                  15

Val Ala Ile Lys Ser Ile Ile Asn His Asn Glu Lys Gly Ile Ser Phe
            20                  25                  30

Tyr Ile Phe Asp Leu Gly Ile Lys Asp Glu Asn Lys Arg Asn Ile Asn
        35                  40                  45

Asp Ile Val Ser Ser Tyr Gly Ser Glu Val Asn Phe Ile Ala Val Asn
    50                  55                  60

Glu Lys Glu Phe Glu Ser Phe Pro Val Gln Ile Ser Tyr Ile Ser Leu
65                  70                  75                  80

Ala Thr Tyr Ala Arg Leu Lys Ala Ala Glu Tyr Leu Pro Asp Asn Leu
                85                  90                  95

Asn Lys Ile Ile Tyr Leu Asp Val Asp Val Leu Val Phe Asn Ser Leu
            100                 105                 110
```

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Glu Met Leu Trp Asn Val Asp Val Asn Asn Phe Leu Thr Ala Ala Cys
        115                 120                 125

Tyr Asp Ser Phe Ile Glu Asn Glu Lys Ser Glu His Lys Lys Ser Ile
    130                 135                 140

Ser Met Ser Asp Lys Glu Tyr Tyr Phe Asn Ala Gly Val Met Leu Phe
145                 150                 155                 160

Asn Leu Asp Glu Trp Arg Lys Met Asp Val Phe Ser Arg Ala Leu Asp
                165                 170                 175

Leu Leu Ala Met Tyr Pro Asn Gln Met Ile Tyr Gln Asp Gln Asp Ile
            180                 185                 190

Leu Asn Ile Leu Phe Arg Asn Lys Val Cys Tyr Leu Asp Cys Arg Phe
        195                 200                 205

Asn Phe Met Pro Asn Gln Leu Glu Arg Ile Lys Gln Tyr His Lys Gly
    210                 215                 220

Lys Leu Ser Asn Leu His Ser Leu Glu Lys Thr Thr Met Pro Val Val
225                 230                 235                 240

Ile Ser His Tyr Cys Gly Pro Glu Lys Ala Trp His Ala Asp Cys Lys
                245                 250                 255

His Phe Asn Val Tyr Phe Tyr Gln Lys Ile Leu Ala Glu Ile Thr Arg
            260                 265                 270

Gly Thr Asp Lys Glu Arg Val Leu Ser Ile Lys Thr Tyr Leu Lys Ala
        275                 280                 285

Leu Ile Arg Arg Ile Arg Tyr Lys Phe Lys Tyr Gln Val Tyr
    290                 295                 300


<210> 108
<211> 2054
<212> DNA
<213> Pasteurella multocida

<220>
<223> pnp

<220>
<221> CDS
<222> (1)..(2052)

<400> 108
atg gca agt atg gat gat act act gtg ttt gtc aca gtg gtt gcc aaa   48
Met Ala Ser Met Asp Asp Thr Thr Val Phe Val Thr Val Val Ala Lys
  1               5                  10                  15

aaa gat gtg aaa gaa ggt caa gac ttc ttc cca tta act gtt aac tat   96
Lys Asp Val Lys Glu Gly Gln Asp Phe Phe Pro Leu Thr Val Asn Tyr
             20                  25                  30

caa gag cgt act tat gct gca ggc cgt att cct ggt ggc ttt ttc aaa   144
Gln Glu Arg Thr Tyr Ala Ala Gly Arg Ile Pro Gly Gly Phe Phe Lys
         35                  40                  45

cgt gaa ggt cgt cct tct gaa ggc gaa act tta att gct cgt tta att   192
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```
Arg Glu Gly Arg Pro Ser Glu Gly Glu Thr Leu Ile Ala Arg Leu Ile
     50                  55                  60

gac cgt cca att cgt cct ctt ttc cca gaa ggt ttt tat aac gaa atc   240
Asp Arg Pro Ile Arg Pro Leu Phe Pro Glu Gly Phe Tyr Asn Glu Ile
 65                  70                  75                  80

caa atc gtg gcg aca gtg gtg tct gtt aat ccg caa att tgt cca gat   288
Gln Ile Val Ala Thr Val Val Ser Val Asn Pro Gln Ile Cys Pro Asp
                 85                  90                  95

tta gtg gca atg atc ggt gca tct gcg gca ctt tct tta tca ggt gtg   336
Leu Val Ala Met Ile Gly Ala Ser Ala Ala Leu Ser Leu Ser Gly Val
            100                 105                 110


cca ttt aat ggc cct atc ggt gcg gca cgt gtt ggt ttt att gat gat   384
Pro Phe Asn Gly Pro Ile Gly Ala Ala Arg Val Gly Phe Ile Asp Asp
        115                 120                 125

caa ttt gtg tta aac cca acc atg aac gag caa aaa caa agc cgt tta   432
Gln Phe Val Leu Asn Pro Thr Met Asn Glu Gln Lys Gln Ser Arg Leu
    130                 135                 140

gac ttg gtt gtc gcg gga aca gat aaa gcg gtg tta atg gtg gaa tct   480
Asp Leu Val Val Ala Gly Thr Asp Lys Ala Val Leu Met Val Glu Ser
145                 150                 155                 160

gaa gcc gat gta tta acc gaa gaa caa atg tta gct gcg gtg gtg ttt   528
Glu Ala Asp Val Leu Thr Glu Glu Gln Met Leu Ala Ala Val Val Phe
                165                 170                 175

ggt cat cag caa caa caa gtg gtg att gac gcg atc aaa gaa ttt acc   576
Gly His Gln Gln Gln Gln Val Val Ile Asp Ala Ile Lys Glu Phe Thr
            180                 185                 190

gca gaa gcc ggt aaa ccg cgt tgg gat tgg gtg gca cct gaa cca aat   624
Ala Glu Ala Gly Lys Pro Arg Trp Asp Trp Val Ala Pro Glu Pro Asn
        195                 200                 205

acc gcg tta att gaa aaa gtg aaa gcg att gca gaa gcg cgt tta ggc   672
Thr Ala Leu Ile Glu Lys Val Lys Ala Ile Ala Glu Ala Arg Leu Gly
    210                 215                 220

gaa gca tac cgt atc act gaa aaa caa gca cgt tat gaa caa att gat   720
Glu Ala Tyr Arg Ile Thr Glu Lys Gln Ala Arg Tyr Glu Gln Ile Asp
225                 230                 235                 240

gcg att aaa gct gat gtg att gca caa atc aca gct gaa gta gca gaa   768
Ala Ile Lys Ala Asp Val Ile Ala Gln Ile Thr Ala Glu Val Ala Glu
                245                 250                 255

ggc gaa gac atc agt gaa ggg aaa att gtc gat att ttc acc gca ctt   816
Gly Glu Asp Ile Ser Glu Gly Lys Ile Val Asp Ile Phe Thr Ala Leu
            260                 265                 270

gaa agc caa atc gta cgt agc cgt atc att gct ggt gaa cca cgt att   864
Glu Ser Gln Ile Val Arg Ser Arg Ile Ile Ala Gly Glu Pro Arg Ile
        275                 280                 285

gat ggt cgt aca gtg gat act gtt cgt gca tta gat att tgt act ggt   912
Asp Gly Arg Thr Val Asp Thr Val Arg Ala Leu Asp Ile Cys Thr Gly
    290                 295                 300
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gtt tta cca cgt aca cac ggt tct gcg att ttc acc cgt ggt gaa aca   960
Val Leu Pro Arg Thr His Gly Ser Ala Ile Phe Thr Arg Gly Glu Thr
305                 310                 315                 320

cag gcg tta gct gtc gcg aca tta ggt aca gaa cgt gat gca caa att   1008
Gln Ala Leu Ala Val Ala Thr Leu Gly Thr Glu Arg Asp Ala Gln Ile
                325                 330                 335

att gat gaa tta aca ggt gag cgt tca gat cac ttc tta ttc cac tac   1056
Ile Asp Glu Leu Thr Gly Glu Arg Ser Asp His Phe Leu Phe His Tyr
            340                 345                 350


aac ttc ccg cca tat tct gtg ggt gaa acc ggt atg att ggt tca cca   1104
Asn Phe Pro Pro Tyr Ser Val Gly Glu Thr Gly Met Ile Gly Ser Pro
        355                 360                 365

aaa cgt cgt gaa att ggt cat ggt cgt tta gcg aaa cgc ggt gta gct   1152
Lys Arg Arg Glu Ile Gly His Gly Arg Leu Ala Lys Arg Gly Val Ala
    370                 375                 380

gca gtg atg cca aca ctt gcc gag ttc ccg tat gtg gta cgt gtt gtc   1200
Ala Val Met Pro Thr Leu Ala Glu Phe Pro Tyr Val Val Arg Val Val
385                 390                 395                 400

tct gaa atc aca gaa tca aat ggt tct tct tct atg gca tcg gtt tgt   1248
Ser Glu Ile Thr Glu Ser Asn Gly Ser Ser Ser Met Ala Ser Val Cys
                405                 410                 415

ggt gcg tct tta gca tta atg gat gcg ggt gta cca att aaa gcg gcg   1296
Gly Ala Ser Leu Ala Leu Met Asp Ala Gly Val Pro Ile Lys Ala Ala
            420                 425                 430

gtt gca ggt att gca atg ggc tta gtc aaa gaa gac gaa aaa ttt gtg   1344
Val Ala Gly Ile Ala Met Gly Leu Val Lys Glu Asp Glu Lys Phe Val
        435                 440                 445

gtg ctt tca gac atc tta ggt gat gaa gat cac tta ggt gac atg gac   1392
Val Leu Ser Asp Ile Leu Gly Asp Glu Asp His Leu Gly Asp Met Asp
    450                 455                 460

ttc aaa gtc gcg ggt aca cgt acg ggt gtg acg gca tta caa atg gat   1440
Phe Lys Val Ala Gly Thr Arg Thr Gly Val Thr Ala Leu Gln Met Asp
465                 470                 475                 480

atc aaa atc gaa ggt atc aca gca gaa atc atg caa att gcg tta aac   1488
Ile Lys Ile Glu Gly Ile Thr Ala Glu Ile Met Gln Ile Ala Leu Asn
                485                 490                 495

caa gcg aaa agc gca cgt tta cac att tta ggt gtg atg gag caa gcg   1536
Gln Ala Lys Ser Ala Arg Leu His Ile Leu Gly Val Met Glu Gln Ala
            500                 505                 510

atc cca gcg cca cgt gcg gat att tct gat ttt gca ccg cgt att tac   1584
Ile Pro Ala Pro Arg Ala Asp Ile Ser Asp Phe Ala Pro Arg Ile Tyr
        515                 520                 525

act atg aaa att gat ccg aag aaa atc aaa gat gtg atc ggt aaa ggt   1632
Thr Met Lys Ile Asp Pro Lys Lys Ile Lys Asp Val Ile Gly Lys Gly
    530                 535                 540

ggt gca acc att cgt gcc tta aca gaa gaa aca ggt acc tca att gat   1680
Gly Ala Thr Ile Arg Ala Leu Thr Glu Glu Thr Gly Thr Ser Ile Asp
```

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545                 550                 555                 560

atc gat gat gat ggt acg gtg aag att gct gcg gtt gat ggc aat tca   1728
Ile Asp Asp Asp Gly Thr Val Lys Ile Ala Ala Val Asp Gly Asn Ser
                565                 570                 575

gca aaa gag gtg atg gcg cgt att gaa gat att act gca gaa gtt gaa   1776
Ala Lys Glu Val Met Ala Arg Ile Glu Asp Ile Thr Ala Glu Val Glu
            580                 585                 590


gcg ggt gca gtg tat aaa ggt aaa gtt act cgt tta gct gat ttt ggt   1824
Ala Gly Ala Val Tyr Lys Gly Lys Val Thr Arg Leu Ala Asp Phe Gly
        595                 600                 605

gcc ttc gtt tct atc gta ggt aac aaa gaa ggc tta gtg cat att tct   1872
Ala Phe Val Ser Ile Val Gly Asn Lys Glu Gly Leu Val His Ile Ser
    610                 615                 620

caa atc gcg gaa gag cgt gtt gag aaa gtg agt gat tat ctt gca gtg   1920
Gln Ile Ala Glu Glu Arg Val Glu Lys Val Ser Asp Tyr Leu Ala Val
625                 630                 635                 640

ggg caa gaa gtg act gtt aaa gtg gtt gag att gat cgt caa ggt cgt   1968
Gly Gln Glu Val Thr Val Lys Val Val Glu Ile Asp Arg Gln Gly Arg
                645                 650                 655

att cgt tta acc atg aaa gaa gtt gca cca aag caa gaa cac gtt gat   2016
Ile Arg Leu Thr Met Lys Glu Val Ala Pro Lys Gln Glu His Val Asp
            660                 665                 670

tct gtt gtc gca gac gtt gcc gca gaa gaa aac gca ta               2054
Ser Val Val Ala Asp Val Ala Ala Glu Glu Asn Ala
        675                 680


<210> 109
<211> 684
<212> PRT
<213> Pasteurella multocida

<400> 109
Met Ala Ser Met Asp Asp Thr Thr Val Phe Val Thr Val Val Ala Lys
  1               5                  10                  15

Lys Asp Val Lys Glu Gly Gln Asp Phe Phe Pro Leu Thr Val Asn Tyr
             20                  25                  30

Gln Glu Arg Thr Tyr Ala Ala Gly Arg Ile Pro Gly Gly Phe Phe Lys
         35                  40                  45

Arg Glu Gly Arg Pro Ser Glu Gly Glu Thr Leu Ile Ala Arg Leu Ile
     50                  55                  60

Asp Arg Pro Ile Arg Pro Leu Phe Pro Glu Gly Phe Tyr Asn Glu Ile
 65                  70                  75                  80

Gln Ile Val Ala Thr Val Val Ser Val Asn Pro Gln Ile Cys Pro Asp
                 85                  90                  95

Leu Val Ala Met Ile Gly Ala Ser Ala Ala Leu Ser Leu Ser Gly Val
            100                 105                 110
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Pro Phe Asn Gly Pro Ile Gly Ala Ala Arg Val Gly Phe Ile Asp Asp
        115                 120                 125

Gln Phe Val Leu Asn Pro Thr Met Asn Glu Gln Lys Gln Ser Arg Leu
    130                 135                 140

Asp Leu Val Val Ala Gly Thr Asp Lys Ala Val Leu Met Val Glu Ser
145                 150                 155                 160

Glu Ala Asp Val Leu Thr Glu Glu Gln Met Leu Ala Ala Val Val Phe
                165                 170                 175

Gly His Gln Gln Gln Gln Val Val Ile Asp Ala Ile Lys Glu Phe Thr
            180                 185                 190

Ala Glu Ala Gly Lys Pro Arg Trp Asp Trp Val Ala Pro Glu Pro Asn
        195                 200                 205

Thr Ala Leu Ile Glu Lys Val Lys Ala Ile Ala Glu Ala Arg Leu Gly
    210                 215                 220

Glu Ala Tyr Arg Ile Thr Glu Lys Gln Ala Arg Tyr Glu Gln Ile Asp
225                 230                 235                 240

Ala Ile Lys Ala Asp Val Ile Ala Gln Ile Thr Ala Glu Val Ala Glu
                245                 250                 255

Gly Glu Asp Ile Ser Glu Gly Lys Ile Val Asp Ile Phe Thr Ala Leu
            260                 265                 270

Glu Ser Gln Ile Val Arg Ser Arg Ile Ile Ala Gly Glu Pro Arg Ile
        275                 280                 285

Asp Gly Arg Thr Val Asp Thr Val Arg Ala Leu Asp Ile Cys Thr Gly
    290                 295                 300

Val Leu Pro Arg Thr His Gly Ser Ala Ile Phe Thr Arg Gly Glu Thr
305                 310                 315                 320

Gln Ala Leu Ala Val Ala Thr Leu Gly Thr Glu Arg Asp Ala Gln Ile
                325                 330                 335

Ile Asp Glu Leu Thr Gly Glu Arg Ser Asp His Phe Leu Phe His Tyr
            340                 345                 350

Asn Phe Pro Pro Tyr Ser Val Gly Glu Thr Gly Met Ile Gly Ser Pro
        355                 360                 365

Lys Arg Arg Glu Ile Gly His Gly Arg Leu Ala Lys Arg Gly Val Ala
    370                 375                 380

Ala Val Met Pro Thr Leu Ala Glu Phe Pro Tyr Val Val Arg Val Val
385                 390                 395                 400

Ser Glu Ile Thr Glu Ser Asn Gly Ser Ser Ser Met Ala Ser Val Cys
                405                 410                 415

Gly Ala Ser Leu Ala Leu Met Asp Ala Gly Val Pro Ile Lys Ala Ala
            420                 425                 430

Val Ala Gly Ile Ala Met Gly Leu Val Lys Glu Asp Glu Lys Phe Val
        435                 440                 445
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Val Leu Ser Asp Ile Leu Gly Asp Glu Asp His Leu Gly Asp Met Asp
    450                 455                 460

Phe Lys Val Ala Gly Thr Arg Thr Gly Val Thr Ala Leu Gln Met Asp
465                 470                 475                 480

Ile Lys Ile Glu Gly Ile Thr Ala Glu Ile Met Gln Ile Ala Leu Asn
                485                 490                 495

Gln Ala Lys Ser Ala Arg Leu His Ile Leu Gly Val Met Glu Gln Ala
            500                 505                 510

Ile Pro Ala Pro Arg Ala Asp Ile Ser Asp Phe Ala Pro Arg Ile Tyr
        515                 520                 525

Thr Met Lys Ile Asp Pro Lys Lys Ile Lys Asp Val Ile Gly Lys Gly
    530                 535                 540

Gly Ala Thr Ile Arg Ala Leu Thr Glu Glu Thr Gly Thr Ser Ile Asp
545                 550                 555                 560

Ile Asp Asp Asp Gly Thr Val Lys Ile Ala Ala Val Asp Gly Asn Ser
                565                 570                 575

Ala Lys Glu Val Met Ala Arg Ile Glu Asp Ile Thr Ala Glu Val Glu
            580                 585                 590

Ala Gly Ala Val Tyr Lys Gly Lys Val Thr Arg Leu Ala Asp Phe Gly
        595                 600                 605

Ala Phe Val Ser Ile Val Gly Asn Lys Glu Gly Leu Val His Ile Ser
    610                 615                 620

Gln Ile Ala Glu Glu Arg Val Glu Lys Val Ser Asp Tyr Leu Ala Val
625                 630                 635                 640

Gly Gln Glu Val Thr Val Lys Val Val Glu Ile Asp Arg Gln Gly Arg
                645                 650                 655

Ile Arg Leu Thr Met Lys Glu Val Ala Pro Lys Gln Glu His Val Asp
            660                 665                 670

Ser Val Val Ala Asp Val Ala Ala Glu Glu Asn Ala
        675                 680


<210> 110
<211> 1514
<212> DNA
<213> Pasteurella multocida

<220>
<223> purF

<220>
<221> CDS
<222> (1)..(1512)

<400> 110
atg tgt ggt att gtt ggt att gtt agc caa agc ccc gtt aac caa tca   48
Met Cys Gly Ile Val Gly Ile Val Ser Gln Ser Pro Val Asn Gln Ser
  1               5                  10                  15
```

```
att tat gat gcg tta acc tta ttg caa cac cgc ggg caa gac gcc gcc   96
Ile Tyr Asp Ala Leu Thr Leu Leu Gln His Arg Gly Gln Asp Ala Ala
            20                  25                  30

ggg att gta acc gta gat gat gaa aac cga ttc cgc ttg cgt aaa gcg  144
Gly Ile Val Thr Val Asp Asp Glu Asn Arg Phe Arg Leu Arg Lys Ala
        35                  40                  45

aac ggg tta gtc agc gat gta ttt gaa caa gtt cat atg tta cgt tta  192
Asn Gly Leu Val Ser Asp Val Phe Glu Gln Val His Met Leu Arg Leu
    50                  55                  60

caa ggc aat gct ggc att gga cat gtt cgt tat cct acg gct ggg agc  240
Gln Gly Asn Ala Gly Ile Gly His Val Arg Tyr Pro Thr Ala Gly Ser
65                  70                  75                  80

tca agt gtc tct gaa gcg caa cct ttt tat gta aat tcg cct tat ggc  288
Ser Ser Val Ser Glu Ala Gln Pro Phe Tyr Val Asn Ser Pro Tyr Gly
                85                  90                  95

tta acc tta gtg cat aat ggt aac ttg acc aat tca agt gaa tta aaa  336
Leu Thr Leu Val His Asn Gly Asn Leu Thr Asn Ser Ser Glu Leu Lys
            100                 105                 110

gaa aag tta ttt cgt ctc gca cgt cgc cat gta aat acc aat tca gat  384
Glu Lys Leu Phe Arg Leu Ala Arg Arg His Val Asn Thr Asn Ser Asp
        115                 120                 125

tct gaa tta tta ctc aat atc tta gcc aat cac ctt gat cac ttc gaa  432
Ser Glu Leu Leu Leu Asn Ile Leu Ala Asn His Leu Asp His Phe Glu
    130                 135                 140

aaa tac caa tta gat ccg caa gat gta ttc agt gct gtc aaa caa acg  480
Lys Tyr Gln Leu Asp Pro Gln Asp Val Phe Ser Ala Val Lys Gln Thr
145                 150                 155                 160

cat cag gat att cgt ggt gct tat gct tgt atc gcc atg att att ggt  528
His Gln Asp Ile Arg Gly Ala Tyr Ala Cys Ile Ala Met Ile Ile Gly
                165                 170                 175

cat ggt atg gtc gcg ttt cgt gat ccg aac ggt atc cgt ccg tta gtg  576
His Gly Met Val Ala Phe Arg Asp Pro Asn Gly Ile Arg Pro Leu Val
            180                 185                 190

tta ggg aaa cgc gag gaa aat ggc aaa aca gag tat atg ttt gcc tcc  624
Leu Gly Lys Arg Glu Glu Asn Gly Lys Thr Glu Tyr Met Phe Ala Ser
        195                 200                 205

gaa agt atc gca tta gat aca gtg ggt ttt gag ttt gta cga gat gta  672
Glu Ser Ile Ala Leu Asp Thr Val Gly Phe Glu Phe Val Arg Asp Val
    210                 215                 220

caa ccc ggc gaa gcg att tat gtc acg ttt gaa ggg gaa atg tat gct  720
Gln Pro Gly Glu Ala Ile Tyr Val Thr Phe Glu Gly Glu Met Tyr Ala
225                 230                 235                 240

cag caa tgc gca gac aaa cca aca tta aca cct tgt att ttt gaa tac  768
Gln Gln Cys Ala Asp Lys Pro Thr Leu Thr Pro Cys Ile Phe Glu Tyr
                245                 250                 255

gtc tat ttt gca cgt cca gac tct tgc atc gat ggg gtt tct gtt tat  816
Val Tyr Phe Ala Arg Pro Asp Ser Cys Ile Asp Gly Val Ser Val Tyr
            260                 265                 270
```

```
gct gcc cgt gtt cat atg gga caa cgt tta ggt gaa aaa att gca cgg   864
Ala Ala Arg Val His Met Gly Gln Arg Leu Gly Glu Lys Ile Ala Arg
        275                 280                 285

gaa tgg gcg gat gtg gat gat att gat gtg gtc att cct gtg cct gaa   912
Glu Trp Ala Asp Val Asp Asp Ile Asp Val Val Ile Pro Val Pro Glu
    290                 295                 300

acc tct aac gat att gct tta cgt att gcg cgc gtg tta aat aaa ccg   960
Thr Ser Asn Asp Ile Ala Leu Arg Ile Ala Arg Val Leu Asn Lys Pro
305                 310                 315                 320

tat cgt caa ggt ttt gtg aaa aat cgc tat gta gga cgt acg ttt att   1008
Tyr Arg Gln Gly Phe Val Lys Asn Arg Tyr Val Gly Arg Thr Phe Ile
                325                 330                 335

atg ccg ggg cag gca ttg cga gtc agt tct gtt aga cgt aaa ctc aat   1056
Met Pro Gly Gln Ala Leu Arg Val Ser Ser Val Arg Arg Lys Leu Asn
            340                 345                 350

acc att gct tca gaa ttt aaa gat aag aat gtg tta tta gtt gac gac   1104
Thr Ile Ala Ser Glu Phe Lys Asp Lys Asn Val Leu Leu Val Asp Asp
        355                 360                 365

tcg att gta cgt ggt acc acg tct gaa caa att gtc gaa atg gcg aga   1152
Ser Ile Val Arg Gly Thr Thr Ser Glu Gln Ile Val Glu Met Ala Arg
    370                 375                 380

gcg gca ggt gcg aag aaa att tat ttt gcc tct gct gca cca gaa att   1200
Ala Ala Gly Ala Lys Lys Ile Tyr Phe Ala Ser Ala Ala Pro Glu Ile
385                 390                 395                 400

cgt tat cca aat gtg tat ggt att gat atg cca acc aaa aat gaa ttg   1248
Arg Tyr Pro Asn Val Tyr Gly Ile Asp Met Pro Thr Lys Asn Glu Leu
                405                 410                 415

atc gct tat ggt cgt gat gta gat gaa att gct aac tta att ggt gtg   1296
Ile Ala Tyr Gly Arg Asp Val Asp Glu Ile Ala Asn Leu Ile Gly Val
            420                 425                 430

gat aaa ttg att ttc caa gat ttg gat gcg tta act ggt tct gtg caa   1344
Asp Lys Leu Ile Phe Gln Asp Leu Asp Ala Leu Thr Gly Ser Val Gln
        435                 440                 445

caa gaa aat cca agt att caa gac ttt gat tgt tcg gtg ttt aca ggg   1392
Gln Glu Asn Pro Ser Ile Gln Asp Phe Asp Cys Ser Val Phe Thr Gly
    450                 455                 460

gtt tat gtg acg ggc gat att aca cct gaa tat ctg gat aat att gca   1440
Val Tyr Val Thr Gly Asp Ile Thr Pro Glu Tyr Leu Asp Asn Ile Ala
465                 470                 475                 480

gaa cag cgt aat gat atc gcc aag aaa aag cgt gaa aaa gat gct acc   1488
Glu Gln Arg Asn Asp Ile Ala Lys Lys Lys Arg Glu Lys Asp Ala Thr
                485                 490                 495

aat ctt gaa atg cac aat gaa aaa ta                               1514
Asn Leu Glu Met His Asn Glu Lys
            500
```

<210> 111

<211> 504
<212> PRT
<213> Pasteurella multocida

<400> 111
Met Cys Gly Ile Val Gly Ile Val Ser Gln Ser Pro Val Asn Gln Ser
1 5 10 15

Ile Tyr Asp Ala Leu Thr Leu Leu Gln His Arg Gly Gln Asp Ala Ala
20 25 30

Gly Ile Val Thr Val Asp Asp Glu Asn Arg Phe Arg Leu Arg Lys Ala
35 40 45

Asn Gly Leu Val Ser Asp Val Phe Glu Gln Val His Met Leu Arg Leu
50 55 60

Gln Gly Asn Ala Gly Ile Gly His Val Arg Tyr Pro Thr Ala Gly Ser
65 70 75 80

Ser Ser Val Ser Glu Ala Gln Pro Phe Tyr Val Asn Ser Pro Tyr Gly
85 90 95

Leu Thr Leu Val His Asn Gly Asn Leu Thr Asn Ser Ser Glu Leu Lys
100 105 110

Glu Lys Leu Phe Arg Leu Ala Arg Arg His Val Asn Thr Asn Ser Asp
115 120 125

Ser Glu Leu Leu Leu Asn Ile Leu Ala Asn His Leu Asp His Phe Glu
130 135 140

Lys Tyr Gln Leu Asp Pro Gln Asp Val Phe Ser Ala Val Lys Gln Thr
145 150 155 160

His Gln Asp Ile Arg Gly Ala Tyr Ala Cys Ile Ala Met Ile Ile Gly
165 170 175

His Gly Met Val Ala Phe Arg Asp Pro Asn Gly Ile Arg Pro Leu Val
180 185 190

Leu Gly Lys Arg Glu Glu Asn Gly Lys Thr Glu Tyr Met Phe Ala Ser
195 200 205

Glu Ser Ile Ala Leu Asp Thr Val Gly Phe Glu Phe Val Arg Asp Val
210 215 220

Gln Pro Gly Glu Ala Ile Tyr Val Thr Phe Glu Gly Glu Met Tyr Ala
225 230 235 240

Gln Gln Cys Ala Asp Lys Pro Thr Leu Thr Pro Cys Ile Phe Glu Tyr
245 250 255

Val Tyr Phe Ala Arg Pro Asp Ser Cys Ile Asp Gly Val Ser Val Tyr
260 265 270

Ala Ala Arg Val His Met Gly Gln Arg Leu Gly Glu Lys Ile Ala Arg
275 280 285

Glu Trp Ala Asp Val Asp Asp Ile Asp Val Val Ile Pro Val Pro Glu
290 295 300

```
Thr Ser Asn Asp Ile Ala Leu Arg Ile Ala Arg Val Leu Asn Lys Pro
305                 310                 315                 320

Tyr Arg Gln Gly Phe Val Lys Asn Arg Tyr Val Gly Arg Thr Phe Ile
                325                 330                 335

Met Pro Gly Gln Ala Leu Arg Val Ser Ser Val Arg Arg Lys Leu Asn
            340                 345                 350

Thr Ile Ala Ser Glu Phe Lys Asp Lys Asn Val Leu Leu Val Asp Asp
        355                 360                 365

Ser Ile Val Arg Gly Thr Thr Ser Glu Gln Ile Val Glu Met Ala Arg
    370                 375                 380

Ala Ala Gly Ala Lys Lys Ile Tyr Phe Ala Ser Ala Ala Pro Glu Ile
385                 390                 395                 400

Arg Tyr Pro Asn Val Tyr Gly Ile Asp Met Pro Thr Lys Asn Glu Leu
                405                 410                 415

Ile Ala Tyr Gly Arg Asp Val Asp Glu Ile Ala Asn Leu Ile Gly Val
            420                 425                 430

Asp Lys Leu Ile Phe Gln Asp Leu Asp Ala Leu Thr Gly Ser Val Gln
        435                 440                 445

Gln Glu Asn Pro Ser Ile Gln Asp Phe Asp Cys Ser Val Phe Thr Gly
    450                 455                 460

Val Tyr Val Thr Gly Asp Ile Thr Pro Glu Tyr Leu Asp Asn Ile Ala
465                 470                 475                 480

Glu Gln Arg Asn Asp Ile Ala Lys Lys Lys Arg Glu Lys Asp Ala Thr
                485                 490                 495

Asn Leu Glu Met His Asn Glu Lys
            500
```

<210> 112
<211> 989
<212> DNA
<213> Pasteurella multocida

<220>
<223> rci

<220>
<221> CDS
<222> (1)..(987)

<400> 112

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atg gca aca ata aga aaa cgt ggt aac tca tat cgt gct gag ata agc   48
Met Ala Thr Ile Arg Lys Arg Gly Asn Ser Tyr Arg Ala Glu Ile Ser
  1               5                  10                  15

aaa aac gga gta agg aaa tca gca aca ttt aag act aaa tca gaa gct   96
Lys Asn Gly Val Arg Lys Ser Ala Thr Phe Lys Thr Lys Ser Glu Ala
             20                  25                  30

aat gcg tgg gct gtt gac gag gag aga aaa tta gct gat ttg gca aaa   144
```

```
Asn Ala Trp Ala Val Asp Glu Glu Arg Lys Leu Ala Asp Leu Ala Lys
          35                  40                  45

ggt atc gct cca gat att att ttt aga gat gta ata gaa cgc tat caa   192
Gly Ile Ala Pro Asp Ile Ile Phe Arg Asp Val Ile Glu Arg Tyr Gln
     50                  55                  60

aat gaa gtg tct ata act aaa aaa ggc gcg cga aat gaa att ata aga   240
Asn Glu Val Ser Ile Thr Lys Lys Gly Ala Arg Asn Glu Ile Ile Arg
 65                  70                  75                  80

tta aac cgc ttt tta aga tat gat att tct aat ctg tat att cgt gat   288
Leu Asn Arg Phe Leu Arg Tyr Asp Ile Ser Asn Leu Tyr Ile Arg Asp
                 85                  90                  95

tta aga aaa gaa gat ttt gag gag tgg atc aga att cgc cta acc gaa   336
Leu Arg Lys Glu Asp Phe Glu Glu Trp Ile Arg Ile Arg Leu Thr Glu
            100                 105                 110

gta tcg gat gct agc gtt aga cgt gag ctt gtt act ata tcg tca gtg   384
Val Ser Asp Ala Ser Val Arg Arg Glu Leu Val Thr Ile Ser Ser Val
        115                 120                 125

ctg aca aca gca ata aat aag tgg gga tat att tca agg cat cca atg   432
Leu Thr Thr Ala Ile Asn Lys Trp Gly Tyr Ile Ser Arg His Pro Met
    130                 135                 140

act ggt att gaa aaa cca aaa aac tcg gca gaa aga aaa gaa cga tat   480
Thr Gly Ile Glu Lys Pro Lys Asn Ser Ala Glu Arg Lys Glu Arg Tyr
145                 150                 155                 160

tca gaa cag gac att aaa aca ata tta gaa aca gct aga tat tgt gaa   528
Ser Glu Gln Asp Ile Lys Thr Ile Leu Glu Thr Ala Arg Tyr Cys Glu
                165                 170                 175

gat aaa cta ccc ata aca ctc aaa caa aga gta gca att gca atg tta   576
Asp Lys Leu Pro Ile Thr Leu Lys Gln Arg Val Ala Ile Ala Met Leu
            180                 185                 190

ttt gct att gaa acc gct atg cgt gct ggt gag att gct agt ata aaa   624
Phe Ala Ile Glu Thr Ala Met Arg Ala Gly Glu Ile Ala Ser Ile Lys
        195                 200                 205

tgg gat aat gtt ttt ctt gaa aag aga ata gta cat tta ccg aca act   672
Trp Asp Asn Val Phe Leu Glu Lys Arg Ile Val His Leu Pro Thr Thr
    210                 215                 220

aaa aac ggg cac tct aga gat gtg ccg ctt tcg caa aga gct gtt gcg   720
Lys Asn Gly His Ser Arg Asp Val Pro Leu Ser Gln Arg Ala Val Ala
225                 230                 235                 240

cta att tta aaa atg aaa gag gta gaa aat gga gat ctt gtg ttt cag   768
Leu Ile Leu Lys Met Lys Glu Val Glu Asn Gly Asp Leu Val Phe Gln
                245                 250                 255


acc acg cct gaa tca tta agc acc acg ttt aga gtg tta aag aaa gag   816
Thr Thr Pro Glu Ser Leu Ser Thr Thr Phe Arg Val Leu Lys Lys Glu
            260                 265                 270

tgt gga ctt gaa cat ctc cat ttt cat gat acg aga agg gaa gcg ttg   864
Cys Gly Leu Glu His Leu His Phe His Asp Thr Arg Arg Glu Ala Leu
        275                 280                 285
```

```
acg aga tta tct aag aaa gta gat gta atg act cta gcc aaa att agc   912
Thr Arg Leu Ser Lys Lys Val Asp Val Met Thr Leu Ala Lys Ile Ser
    290                 295                 300

gga cat aga gat tta aga att tta caa aac aca tat tac gca ccg aat   960
Gly His Arg Asp Leu Arg Ile Leu Gln Asn Thr Tyr Tyr Ala Pro Asn
305                 310                 315                 320

atg agt gaa gtg gca aac ttg ttg gat ta                            989
Met Ser Glu Val Ala Asn Leu Leu Asp
                325
```

<210> 113
<211> 329
<212> PRT
<213> Pasteurella multocida

<400> 113

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Met Ala Thr Ile Arg Lys Arg Gly Asn Ser Tyr Arg Ala Glu Ile Ser
  1               5                  10                  15

Lys Asn Gly Val Arg Lys Ser Ala Thr Phe Lys Thr Lys Ser Glu Ala
            20                  25                  30

Asn Ala Trp Ala Val Asp Glu Glu Arg Lys Leu Ala Asp Leu Ala Lys
        35                  40                  45

Gly Ile Ala Pro Asp Ile Ile Phe Arg Asp Val Ile Glu Arg Tyr Gln
    50                  55                  60

Asn Glu Val Ser Ile Thr Lys Lys Gly Ala Arg Asn Glu Ile Ile Arg
65                  70                  75                  80

Leu Asn Arg Phe Leu Arg Tyr Asp Ile Ser Asn Leu Tyr Ile Arg Asp
                85                  90                  95

Leu Arg Lys Glu Asp Phe Glu Glu Trp Ile Arg Ile Arg Leu Thr Glu
            100                 105                 110

Val Ser Asp Ala Ser Val Arg Arg Glu Leu Val Thr Ile Ser Ser Val
        115                 120                 125

Leu Thr Thr Ala Ile Asn Lys Trp Gly Tyr Ile Ser Arg His Pro Met
    130                 135                 140

Thr Gly Ile Glu Lys Pro Lys Asn Ser Ala Glu Arg Lys Glu Arg Tyr
145                 150                 155                 160

Ser Glu Gln Asp Ile Lys Thr Ile Leu Glu Thr Ala Arg Tyr Cys Glu
                165                 170                 175

Asp Lys Leu Pro Ile Thr Leu Lys Gln Arg Val Ala Ile Ala Met Leu
            180                 185                 190

Phe Ala Ile Glu Thr Ala Met Arg Ala Gly Glu Ile Ala Ser Ile Lys
        195                 200                 205

Trp Asp Asn Val Phe Leu Glu Lys Arg Ile Val His Leu Pro Thr Thr
    210                 215                 220

Lys Asn Gly His Ser Arg Asp Val Pro Leu Ser Gln Arg Ala Val Ala
```

```
225                 230                 235                 240

Leu Ile Leu Lys Met Lys Glu Val Glu Asn Gly Asp Leu Val Phe Gln
                245                 250                 255

Thr Thr Pro Glu Ser Leu Ser Thr Thr Phe Arg Val Leu Lys Lys Glu
            260                 265                 270

Cys Gly Leu Glu His Leu His Phe His Asp Thr Arg Arg Glu Ala Leu
        275                 280                 285

Thr Arg Leu Ser Lys Lys Val Asp Val Met Thr Leu Ala Lys Ile Ser
    290                 295                 300

Gly His Arg Asp Leu Arg Ile Leu Gln Asn Thr Tyr Tyr Ala Pro Asn
305                 310                 315                 320

Met Ser Glu Val Ala Asn Leu Leu Asp
                325
```

<210> 114
<211> 1190
<212> DNA
<213> Pasteurella multocida

<220>
<223> sopE

<220>
<221> CDS
<222> (1)..(1188)

<400> 114

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atg tct gaa gaa tat cta cat ggt gtc aaa gtc aca gaa atc aat caa   48
Met Ser Glu Glu Tyr Leu His Gly Val Lys Val Thr Glu Ile Asn Gln
  1               5                  10                  15

gca att cgc aca att caa agt cta tca acc gca gtc atc ggt att gtc   96
Ala Ile Arg Thr Ile Gln Ser Leu Ser Thr Ala Val Ile Gly Ile Val
            20                  25                  30

tgt act gca aat gac gca gac aat gaa aca ttc cca ctc aat gaa ccc   144
Cys Thr Ala Asn Asp Ala Asp Asn Glu Thr Phe Pro Leu Asn Glu Pro
        35                  40                  45

gtt ctc atc aca aac gtg gca gcg gca att ggc aag gct gga aaa caa   192
Val Leu Ile Thr Asn Val Ala Ala Ala Ile Gly Lys Ala Gly Lys Gln
    50                  55                  60

ggc acg ctt tca cgt gcg ctt gac ggg att tct gat gta gtc aat tgc   240
Gly Thr Leu Ser Arg Ala Leu Asp Gly Ile Ser Asp Val Val Asn Cys
65                  70                  75                  80

aaa gtg att gtt gtg cga gtg caa gaa agt gcg caa gaa gac gaa gaa   288
Lys Val Ile Val Val Arg Val Gln Glu Ser Ala Gln Glu Asp Glu Glu
                85                  90                  95

aca aaa gca agt gaa atg aac acg gca att att ggc aca atc aca gaa   336
Thr Lys Ala Ser Glu Met Asn Thr Ala Ile Ile Gly Thr Ile Thr Glu
            100                 105                 110
```

```
gaa ggg cag tac aca ggc ttg aag gcg tta ttg att gcg aaa aac aaa   384
Glu Gly Gln Tyr Thr Gly Leu Lys Ala Leu Leu Ile Ala Lys Asn Lys
        115                 120                 125

ttc ggt atc aaa cca cgt att tta tgt gtg cca aaa ttc gac aca aaa   432
Phe Gly Ile Lys Pro Arg Ile Leu Cys Val Pro Lys Phe Asp Thr Lys
    130                 135                 140

gaa gtc gcc aca gag ctt gca agt atc gcc gcc aaa ctc aac gca ttt   480
Glu Val Ala Thr Glu Leu Ala Ser Ile Ala Ala Lys Leu Asn Ala Phe
145                 150                 155                 160

gct tac att tca tgt caa ggg tgt aaa acg aaa gaa caa gcg gtg caa   528
Ala Tyr Ile Ser Cys Gln Gly Cys Lys Thr Lys Glu Gln Ala Val Gln
                165                 170                 175

tat aaa cgc aac ttc tca caa cgt gaa gtc atg ctg atc atg ggc gat   576
Tyr Lys Arg Asn Phe Ser Gln Arg Glu Val Met Leu Ile Met Gly Asp
            180                 185                 190

ttt ctg tca ttt aat gtc aac aca tca aaa gtt gag att gac tat gcc   624
Phe Leu Ser Phe Asn Val Asn Thr Ser Lys Val Glu Ile Asp Tyr Ala
        195                 200                 205

gtc act cgt gcg gcg gca atg cgt gca tat ctt gat aaa gaa cag ggc   672
Val Thr Arg Ala Ala Ala Met Arg Ala Tyr Leu Asp Lys Glu Gln Gly
    210                 215                 220

tgg cat acg tct att tca aat aaa ggc att aat ggc gtg agc ggt gtc   720
Trp His Thr Ser Ile Ser Asn Lys Gly Ile Asn Gly Val Ser Gly Val
225                 230                 235                 240

aca caa cca ctc tat ttt gac att aac gac agc tcg act gat gtg aac   768
Thr Gln Pro Leu Tyr Phe Asp Ile Asn Asp Ser Ser Thr Asp Val Asn
                245                 250                 255

tat ctc aat gaa caa ggc atc acg tgt tgc gtg aat cat aat ggc ttt   816
Tyr Leu Asn Glu Gln Gly Ile Thr Cys Cys Val Asn His Asn Gly Phe
            260                 265                 270

cgt ttt tgg ggc tta cgc acg act gca gaa gat cca tta ttc aag ttt   864
Arg Phe Trp Gly Leu Arg Thr Thr Ala Glu Asp Pro Leu Phe Lys Phe
        275                 280                 285

gaa gtg tac acc cgc act gca caa atc tta aaa gat acg att gca ggg   912
Glu Val Tyr Thr Arg Thr Ala Gln Ile Leu Lys Asp Thr Ile Ala Gly
    290                 295                 300


gcg ttt gat tgg gca gtg gat aaa gat att tct gtc acg cta gtg aaa   960
Ala Phe Asp Trp Ala Val Asp Lys Asp Ile Ser Val Thr Leu Val Lys
305                 310                 315                 320

gat att att gaa gca atc aat gcg aag tgg cgt gat tac acc aca aaa   1008
Asp Ile Ile Glu Ala Ile Asn Ala Lys Trp Arg Asp Tyr Thr Thr Lys
                325                 330                 335

ggc tac tta att ggc ggt aaa gcg tgg ctt aat aaa gag ctt aac agt   1056
Gly Tyr Leu Ile Gly Gly Lys Ala Trp Leu Asn Lys Glu Leu Asn Ser
            340                 345                 350

gca acg aat tta aaa gat gcg aag ttg ttg atc tct tat gat tat cac   1104
Ala Thr Asn Leu Lys Asp Ala Lys Leu Leu Ile Ser Tyr Asp Tyr His
```

```
        355                 360                 365

cca gta cca ccg ctc gaa cag cta ggc ttt aat cag tac att tct gat   1152
Pro Val Pro Pro Leu Glu Gln Leu Gly Phe Asn Gln Tyr Ile Ser Asp
    370                 375                 380

gaa tac ctt gtt gat ttt tca aat cgt tta gca tcg ta               1190
Glu Tyr Leu Val Asp Phe Ser Asn Arg Leu Ala Ser
385                 390                 395
```

<210> 115
<211> 396
<212> PRT
<213> Pasteurella multocida

<400> 115

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Met Ser Glu Glu Tyr Leu His Gly Val Lys Val Thr Glu Ile Asn Gln
  1               5                  10                  15

Ala Ile Arg Thr Ile Gln Ser Leu Ser Thr Ala Val Ile Gly Ile Val
             20                  25                  30

Cys Thr Ala Asn Asp Ala Asp Asn Glu Thr Phe Pro Leu Asn Glu Pro
         35                  40                  45

Val Leu Ile Thr Asn Val Ala Ala Ala Ile Gly Lys Ala Gly Lys Gln
     50                  55                  60

Gly Thr Leu Ser Arg Ala Leu Asp Gly Ile Ser Asp Val Val Asn Cys
 65                  70                  75                  80

Lys Val Ile Val Val Arg Val Gln Glu Ser Ala Gln Glu Asp Glu Glu
                 85                  90                  95

Thr Lys Ala Ser Glu Met Asn Thr Ala Ile Ile Gly Thr Ile Thr Glu
            100                 105                 110

Glu Gly Gln Tyr Thr Gly Leu Lys Ala Leu Leu Ile Ala Lys Asn Lys
        115                 120                 125

Phe Gly Ile Lys Pro Arg Ile Leu Cys Val Pro Lys Phe Asp Thr Lys
    130                 135                 140

Glu Val Ala Thr Glu Leu Ala Ser Ile Ala Ala Lys Leu Asn Ala Phe
145                 150                 155                 160

Ala Tyr Ile Ser Cys Gln Gly Cys Lys Thr Lys Glu Gln Ala Val Gln
                165                 170                 175

Tyr Lys Arg Asn Phe Ser Gln Arg Glu Val Met Leu Ile Met Gly Asp
            180                 185                 190

Phe Leu Ser Phe Asn Val Asn Thr Ser Lys Val Glu Ile Asp Tyr Ala
        195                 200                 205

Val Thr Arg Ala Ala Ala Met Arg Ala Tyr Leu Asp Lys Glu Gln Gly
    210                 215                 220

Trp His Thr Ser Ile Ser Asn Lys Gly Ile Asn Gly Val Ser Gly Val
225                 230                 235                 240

Thr Gln Pro Leu Tyr Phe Asp Ile Asn Asp Ser Ser Thr Asp Val Asn
```

```
                245                 250                 255

Tyr Leu Asn Glu Gln Gly Ile Thr Cys Cys Val Asn His Asn Gly Phe
            260                 265                 270

Arg Phe Trp Gly Leu Arg Thr Thr Ala Glu Asp Pro Leu Phe Lys Phe
        275                 280                 285

Glu Val Tyr Thr Arg Thr Ala Gln Ile Leu Lys Asp Thr Ile Ala Gly
    290                 295                 300

Ala Phe Asp Trp Ala Val Asp Lys Asp Ile Ser Val Thr Leu Val Lys
305                 310                 315                 320

Asp Ile Ile Glu Ala Ile Asn Ala Lys Trp Arg Asp Tyr Thr Thr Lys
                325                 330                 335

Gly Tyr Leu Ile Gly Gly Lys Ala Trp Leu Asn Lys Glu Leu Asn Ser
            340                 345                 350

Ala Thr Asn Leu Lys Asp Ala Lys Leu Leu Ile Ser Tyr Asp Tyr His
        355                 360                 365

Pro Val Pro Pro Leu Glu Gln Leu Gly Phe Asn Gln Tyr Ile Ser Asp
    370                 375                 380

Glu Tyr Leu Val Asp Phe Ser Asn Arg Leu Ala Ser
385                 390                 395


<210> 116
<211> 2204
<212> DNA
<213> Pasteurella multocida

<220>
<223> unkK

<220>
<221> CDS
<222> (1)..(2202)



<400> 116
atg aat aaa aat cgc tat aaa ctc att ttt agt aaa act aaa ggc tgt   48
Met Asn Lys Asn Arg Tyr Lys Leu Ile Phe Ser Lys Thr Lys Gly Cys
  1               5                  10                  15

ctt gta cct gtt gct gaa acg att aat tct gca gta gga aat gcc tca   96
Leu Val Pro Val Ala Glu Thr Ile Asn Ser Ala Val Gly Asn Ala Ser
             20                  25                  30

tca aaa gac gtt tct gac acc gag ata agt gct tct caa cca gcg ctc   144
Ser Lys Asp Val Ser Asp Thr Glu Ile Ser Ala Ser Gln Pro Ala Leu
         35                  40                  45

aac tcg ccg ctt tcg acc ctt tct gta tta gtc aaa acc gca ttt aat   192
Asn Ser Pro Leu Ser Thr Leu Ser Val Leu Val Lys Thr Ala Phe Asn
     50                  55                  60

ccg gtt tca aca ttg atg tcg ttg act tgg aaa gaa tac gcc gtt tta   240
```

```
Pro Val Ser Thr Leu Met Ser Leu Thr Trp Lys Glu Tyr Ala Val Leu
 65                  70                  75                  80

tta tta agt gtg gtg tct ttt cct ctt atg gca caa gcc tct gat aca   288
Leu Leu Ser Val Val Ser Phe Pro Leu Met Ala Gln Ala Ser Asp Thr
                 85                  90                  95

gat tca gtg gta caa aga aaa cct gaa tta act gat gtg acg aat agc   336
Asp Ser Val Val Gln Arg Lys Pro Glu Leu Thr Asp Val Thr Asn Ser
            100                 105                 110

aac agc tat cat gtg gaa tta gat aga gag cat cat aaa ggg gag cat   384
Asn Ser Tyr His Val Glu Leu Asp Arg Glu His His Lys Gly Glu His
        115                 120                 125

caa aca aaa atc aaa cat act gag aat aat gtc atc att gtt gat att   432
Gln Thr Lys Ile Lys His Thr Glu Asn Asn Val Ile Ile Val Asp Ile
    130                 135                 140

gca aaa cca aac caa aag ggc att tca gat aac cgt ttt aaa cac ttc   480
Ala Lys Pro Asn Gln Lys Gly Ile Ser Asp Asn Arg Phe Lys His Phe
145                 150                 155                 160

aac atc cca aat ggg gcg gta ttt aac aat agc gcc aag gaa aaa cgc   528
Asn Ile Pro Asn Gly Ala Val Phe Asn Asn Ser Ala Lys Glu Lys Arg
                165                 170                 175

tca cag tta gtg ggg tat ttg cca ggt aac cag aat tta acg gaa ggt   576
Ser Gln Leu Val Gly Tyr Leu Pro Gly Asn Gln Asn Leu Thr Glu Gly
            180                 185                 190

agt gaa gca aaa gcg atc tta aat cag gtg act gga ccg gat gcc agt   624
Ser Glu Ala Lys Ala Ile Leu Asn Gln Val Thr Gly Pro Asp Ala Ser
        195                 200                 205

aaa att gaa ggc gcc ctt gaa att tta ggg caa aaa gcc gat ttg gtg   672
Lys Ile Glu Gly Ala Leu Glu Ile Leu Gly Gln Lys Ala Asp Leu Val
    210                 215                 220

att gcg aac caa aat ggc att gtg ctt aat ggg gta aaa acc att aat   720
Ile Ala Asn Gln Asn Gly Ile Val Leu Asn Gly Val Lys Thr Ile Asn
225                 230                 235                 240

gcc aat cgt ttt gtg gca aca acc agt agt acc att gat cct gag caa   768
Ala Asn Arg Phe Val Ala Thr Thr Ser Ser Thr Ile Asp Pro Glu Gln
                245                 250                 255

atg cag tta aat gtc acg caa ggt aca gtg aca att ggg gtg gat gga   816
Met Gln Leu Asn Val Thr Gln Gly Thr Val Thr Ile Gly Val Asp Gly
            260                 265                 270

ttt gcc aca gat ggc tta cct tat ttg gat atc att gcc aaa aag att   864
Phe Ala Thr Asp Gly Leu Pro Tyr Leu Asp Ile Ile Ala Lys Lys Ile
        275                 280                 285

gaa caa aaa caa gcg att aca aaa gaa aga aca gga aat tcc gaa acc   912
Glu Gln Lys Gln Ala Ile Thr Lys Glu Arg Thr Gly Asn Ser Glu Thr
    290                 295                 300

gat atc act ttt gtc gca ggt aac agt aaa tat gat tta aag aca cat   960
Asp Ile Thr Phe Val Ala Gly Asn Ser Lys Tyr Asp Leu Lys Thr His
305                 310                 315                 320
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caa gtg aca gaa aag cat acc gct gag gca caa ggt gaa att gcg att   1008
Gln Val Thr Glu Lys His Thr Ala Glu Ala Gln Gly Glu Ile Ala Ile
                325                 330                 335

agc ggt gcg agt acc ggt gca atg tac ggt aaa aat atc aaa tta atc   1056
Ser Gly Ala Ser Thr Gly Ala Met Tyr Gly Lys Asn Ile Lys Leu Ile
            340                 345                 350

gta acg gat aaa ggc gct ggg gta aaa cat gat ggc att att tta tct   1104
Val Thr Asp Lys Gly Ala Gly Val Lys His Asp Gly Ile Ile Leu Ser
        355                 360                 365

gag gcg gat att caa att gaa acc cat gag ggc gat gtt gaa tta ggc   1152
Glu Ala Asp Ile Gln Ile Glu Thr His Glu Gly Asp Val Glu Leu Gly
    370                 375                 380

aat aca aaa aat aat cag aat gag aat tat gcc aaa gct cat gcg gaa   1200
Asn Thr Lys Asn Asn Gln Asn Glu Asn Tyr Ala Lys Ala His Ala Glu
385                 390                 395                 400

ggg aat ttt acg gtt aaa ggc ggt aag cac gtt att att ggt aag gaa   1248
Gly Asn Phe Thr Val Lys Gly Gly Lys His Val Ile Ile Gly Lys Glu
                405                 410                 415

gtt aaa gcc aac aaa gcg gtc gat att caa gca caa gaa aca aca gta   1296
Val Lys Ala Asn Lys Ala Val Asp Ile Gln Ala Gln Glu Thr Thr Val
            420                 425                 430

aga caa aat gcg aaa tta act gcc aaa acg agt gcc aaa att aca gca   1344
Arg Gln Asn Ala Lys Leu Thr Ala Lys Thr Ser Ala Lys Ile Thr Ala
        435                 440                 445

agt aag agt gtg aat ctt gaa gat aac gcg aaa ctt att gct aat gag   1392
Ser Lys Ser Val Asn Leu Glu Asp Asn Ala Lys Leu Ile Ala Asn Glu
    450                 455                 460

ctg agc aca aca acc aat aaa tta acc aat aaa ggt agc att tac ggc   1440
Leu Ser Thr Thr Thr Asn Lys Leu Thr Asn Lys Gly Ser Ile Tyr Gly
465                 470                 475                 480

aag aaa gtg acg cta gat gct gat aat tta gtc aat agt aaa gaa atc   1488
Lys Lys Val Thr Leu Asp Ala Asp Asn Leu Val Asn Ser Lys Glu Ile
                485                 490                 495

tat gcg tct agc gaa ctt gat att caa acc aaa ggt cgt gat ctt tta   1536
Tyr Ala Ser Ser Glu Leu Asp Ile Gln Thr Lys Gly Arg Asp Leu Leu
            500                 505                 510

ctt gag gat ggg gtt aat caa cca ctg agt ttc tta aaa ggc gct tca   1584
Leu Glu Asp Gly Val Asn Gln Pro Leu Ser Phe Leu Lys Gly Ala Ser
        515                 520                 525

ttg tta gcg ccg ggg ttt gtc aac act ggg cta att cac agt aac ggt   1632
Leu Leu Ala Pro Gly Phe Val Asn Thr Gly Leu Ile His Ser Asn Gly
    530                 535                 540

aat gcc aag ctc act ttt aaa gat gac acc agt ttt gtg act gaa gga   1680
Asn Ala Lys Leu Thr Phe Lys Asp Asp Thr Ser Phe Val Thr Glu Gly
545                 550                 555                 560

aat aac ttt atc aca gca aaa gac aac tta gaa atc acg gca aaa aat   1728
Asn Asn Phe Ile Thr Ala Lys Asp Asn Leu Glu Ile Thr Ala Lys Asn
```

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                565                 570                 575

gtt caa att gat caa gcg aaa aat att caa tta aac gcg aat atc acg   1776
Val Gln Ile Asp Gln Ala Lys Asn Ile Gln Leu Asn Ala Asn Ile Thr
            580                 585                 590

atc aat acc aag tct ggt ttt gtg aat tac ggt acc tta gca agt gct   1824
Ile Asn Thr Lys Ser Gly Phe Val Asn Tyr Gly Thr Leu Ala Ser Ala
        595                 600                 605

caa aat tta acg att aat acc gaa caa ggc agc att tat aac ata ggc   1872
Gln Asn Leu Thr Ile Asn Thr Glu Gln Gly Ser Ile Tyr Asn Ile Gly
    610                 615                 620

ggt atc ttg ggg gcg ggt aaa agt ttg aat ctg agc gcg aaa aga gga   1920
Gly Ile Leu Gly Ala Gly Lys Ser Leu Asn Leu Ser Ala Lys Arg Gly
625                 630                 635                 640

gaa aac caa gga gga tat ctt att aat caa ggt aag agt cta ctc cat   1968
Glu Asn Gln Gly Gly Tyr Leu Ile Asn Gln Gly Lys Ser Leu Leu His
                645                 650                 655

tct gaa ggc gcc atg aac ctc aca gcg gat cgc acg gtg tac aat tta   2016
Ser Glu Gly Ala Met Asn Leu Thr Ala Asp Arg Thr Val Tyr Asn Leu
            660                 665                 670

ggg aat att ttt gct aaa ggt gac gcg acg atc aat gca aac gcg tta   2064
Gly Asn Ile Phe Ala Lys Gly Asp Ala Thr Ile Asn Ala Asn Ala Leu
        675                 680                 685

att aat gat gtt act ctc aca ggt cgt ctt gag tat caa gat ctg aaa   2112
Ile Asn Asp Val Thr Leu Thr Gly Arg Leu Glu Tyr Gln Asp Leu Lys
    690                 695                 700

aaa gat tat acg cgt tat tat cgt atc aat gaa acg gca aaa cat ggt   2160
Lys Asp Tyr Thr Arg Tyr Tyr Arg Ile Asn Glu Thr Ala Lys His Gly
705                 710                 715                 720

tgg cat aat aac ttc tat gaa tta aac gtc gac aga gtt tct tg        2204
Trp His Asn Asn Phe Tyr Glu Leu Asn Val Asp Arg Val Ser
                725                 730
```

<210> 117
<211> 734
<212> PRT
<213> Pasteurella multocida

<400> 117

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Met Asn Lys Asn Arg Tyr Lys Leu Ile Phe Ser Lys Thr Lys Gly Cys
  1               5                  10                  15

Leu Val Pro Val Ala Glu Thr Ile Asn Ser Ala Val Gly Asn Ala Ser
             20                  25                  30

Ser Lys Asp Val Ser Asp Thr Glu Ile Ser Ala Ser Gln Pro Ala Leu
         35                  40                  45

Asn Ser Pro Leu Ser Thr Leu Ser Val Leu Val Lys Thr Ala Phe Asn
     50                  55                  60

Pro Val Ser Thr Leu Met Ser Leu Thr Trp Lys Glu Tyr Ala Val Leu
```

```
 65                  70                  75                  80

Leu Leu Ser Val Val Ser Phe Pro Leu Met Ala Gln Ala Ser Asp Thr
                 85                  90                  95

Asp Ser Val Val Gln Arg Lys Pro Glu Leu Thr Asp Val Thr Asn Ser
            100                 105                 110

Asn Ser Tyr His Val Glu Leu Asp Arg Glu His His Lys Gly Glu His
        115                 120                 125

Gln Thr Lys Ile Lys His Thr Glu Asn Asn Val Ile Ile Val Asp Ile
    130                 135                 140

Ala Lys Pro Asn Gln Lys Gly Ile Ser Asp Asn Arg Phe Lys His Phe
145                 150                 155                 160

Asn Ile Pro Asn Gly Ala Val Phe Asn Asn Ser Ala Lys Glu Lys Arg
                165                 170                 175

Ser Gln Leu Val Gly Tyr Leu Pro Gly Asn Gln Asn Leu Thr Glu Gly
            180                 185                 190

Ser Glu Ala Lys Ala Ile Leu Asn Gln Val Thr Gly Pro Asp Ala Ser
        195                 200                 205

Lys Ile Glu Gly Ala Leu Glu Ile Leu Gly Gln Lys Ala Asp Leu Val
    210                 215                 220

Ile Ala Asn Gln Asn Gly Ile Val Leu Asn Gly Val Lys Thr Ile Asn
225                 230                 235                 240

Ala Asn Arg Phe Val Ala Thr Thr Ser Ser Thr Ile Asp Pro Glu Gln
                245                 250                 255

Met Gln Leu Asn Val Thr Gln Gly Thr Val Thr Ile Gly Val Asp Gly
            260                 265                 270

Phe Ala Thr Asp Gly Leu Pro Tyr Leu Asp Ile Ile Ala Lys Lys Ile
        275                 280                 285

Glu Gln Lys Gln Ala Ile Thr Lys Glu Arg Thr Gly Asn Ser Glu Thr
    290                 295                 300

Asp Ile Thr Phe Val Ala Gly Asn Ser Lys Tyr Asp Leu Lys Thr His
305                 310                 315                 320

Gln Val Thr Glu Lys His Thr Ala Glu Ala Gln Gly Glu Ile Ala Ile
                325                 330                 335

Ser Gly Ala Ser Thr Gly Ala Met Tyr Gly Lys Asn Ile Lys Leu Ile
            340                 345                 350

Val Thr Asp Lys Gly Ala Gly Val Lys His Asp Gly Ile Ile Leu Ser
        355                 360                 365

Glu Ala Asp Ile Gln Ile Glu Thr His Glu Gly Asp Val Glu Leu Gly
    370                 375                 380

Asn Thr Lys Asn Asn Gln Asn Glu Asn Tyr Ala Lys Ala His Ala Glu
385                 390                 395                 400

Gly Asn Phe Thr Val Lys Gly Gly Lys His Val Ile Ile Gly Lys Glu
```

405 410 415

Val Lys Ala Asn Lys Ala Val Asp Ile Gln Ala Gln Glu Thr Thr Val
420 425 430

Arg Gln Asn Ala Lys Leu Thr Ala Lys Thr Ser Ala Lys Ile Thr Ala
435 440 445

Ser Lys Ser Val Asn Leu Glu Asp Asn Ala Lys Leu Ile Ala Asn Glu
450 455 460

Leu Ser Thr Thr Thr Asn Lys Leu Thr Asn Lys Gly Ser Ile Tyr Gly
465 470 475 480

Lys Lys Val Thr Leu Asp Ala Asp Asn Leu Val Asn Ser Lys Glu Ile
485 490 495

Tyr Ala Ser Ser Glu Leu Asp Ile Gln Thr Lys Gly Arg Asp Leu Leu
500 505 510

Leu Glu Asp Gly Val Asn Gln Pro Leu Ser Phe Leu Lys Gly Ala Ser
515 520 525

Leu Leu Ala Pro Gly Phe Val Asn Thr Gly Leu Ile His Ser Asn Gly
530 535 540

Asn Ala Lys Leu Thr Phe Lys Asp Asp Thr Ser Phe Val Thr Glu Gly
545 550 555 560

Asn Asn Phe Ile Thr Ala Lys Asp Asn Leu Glu Ile Thr Ala Lys Asn
565 570 575

Val Gln Ile Asp Gln Ala Lys Asn Ile Gln Leu Asn Ala Asn Ile Thr
580 585 590

Ile Asn Thr Lys Ser Gly Phe Val Asn Tyr Gly Thr Leu Ala Ser Ala
595 600 605

Gln Asn Leu Thr Ile Asn Thr Glu Gln Gly Ser Ile Tyr Asn Ile Gly
610 615 620

Gly Ile Leu Gly Ala Gly Lys Ser Leu Asn Leu Ser Ala Lys Arg Gly
625 630 635 640

Glu Asn Gln Gly Gly Tyr Leu Ile Asn Gln Gly Lys Ser Leu Leu His
645 650 655

Ser Glu Gly Ala Met Asn Leu Thr Ala Asp Arg Thr Val Tyr Asn Leu
660 665 670

Gly Asn Ile Phe Ala Lys Gly Asp Ala Thr Ile Asn Ala Asn Ala Leu
675 680 685

Ile Asn Asp Val Thr Leu Thr Gly Arg Leu Glu Tyr Gln Asp Leu Lys
690 695 700

Lys Asp Tyr Thr Arg Tyr Tyr Arg Ile Asn Glu Thr Ala Lys His Gly
705 710 715 720

Trp His Asn Asn Phe Tyr Glu Leu Asn Val Asp Arg Val Ser
725 730

<210> 118
<211> 251
<212> DNA
<213> Pasteurella multocida

<220>
<223> unkO

<220>
<221> CDS
<222> (1)..(249)

<400> 118
atg aaa att act att aca cga aat cat cca gaa gta ttt caa gaa tcc 48
Met Lys Ile Thr Ile Thr Arg Asn His Pro Glu Val Phe Gln Glu Ser
1 5 10 15

gct cgt tta gta gcc gaa aag ttc att aaa gcc caa tgt gta gaa gca 96
Ala Arg Leu Val Ala Glu Lys Phe Ile Lys Ala Gln Cys Val Glu Ala
20 25 30

tta aca ttg gct ttg att gag ggt gtc gag cac ttt gtg ctg gaa ggt 144
Leu Thr Leu Ala Leu Ile Glu Gly Val Glu His Phe Val Leu Glu Gly
35 40 45

gag gag gaa agc aaa agg gga cat agt att aag gtt gta tta aaa gga 192
Glu Glu Glu Ser Lys Arg Gly His Ser Ile Lys Val Val Leu Lys Gly
50 55 60

agt cac gaa gtt att aag tca gag gtg aat aca aat gaa aaa aat cat 240
Ser His Glu Val Ile Lys Ser Glu Val Asn Thr Asn Glu Lys Asn His
65 70 75 80

tgt aat cat ta 251
Cys Asn His

<210> 119
<211> 83
<212> PRT
<213> Pasteurella multocida

<400> 119
Met Lys Ile Thr Ile Thr Arg Asn His Pro Glu Val Phe Gln Glu Ser
1 5 10 15

Ala Arg Leu Val Ala Glu Lys Phe Ile Lys Ala Gln Cys Val Glu Ala
20 25 30

Leu Thr Leu Ala Leu Ile Glu Gly Val Glu His Phe Val Leu Glu Gly
35 40 45

Glu Glu Glu Ser Lys Arg Gly His Ser Ile Lys Val Val Leu Lys Gly
50 55 60

Ser His Glu Val Ile Lys Ser Glu Val Asn Thr Asn Glu Lys Asn His
65 70 75 80

Cys Asn His

<210> 120

<211> 548
<212> DNA
<213> Pasteurella multocida

<220>
<223> unkP

<220>
<221> CDS
<222> (1)..(546)

<400> 120
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atg cgt gca tat ctt gat aaa gaa cag ggc tgg cat acg tct att tca   48
Met Arg Ala Tyr Leu Asp Lys Glu Gln Gly Trp His Thr Ser Ile Ser
  1               5                  10                  15

aat aaa ggc att aat ggc gtg agc ggt gtc aca caa cca ctc tat ttt   96
Asn Lys Gly Ile Asn Gly Val Ser Gly Val Thr Gln Pro Leu Tyr Phe
            20                  25                  30

gac att aac gac agc tcg act gat gtg aac tat ctc aat gaa caa ggc   144
Asp Ile Asn Asp Ser Ser Thr Asp Val Asn Tyr Leu Asn Glu Gln Gly
        35                  40                  45

atc acg tgt tgc gtg aat cat aat ggc ttt cgt ttt tgg ggc tta cgc   192
Ile Thr Cys Cys Val Asn His Asn Gly Phe Arg Phe Trp Gly Leu Arg
    50                  55                  60

acg act gca gaa gat cca tta ttc aag ttt gaa gtg tac acc cgc act   240
Thr Thr Ala Glu Asp Pro Leu Phe Lys Phe Glu Val Tyr Thr Arg Thr
65                  70                  75                  80

gca caa atc tta aaa gat acg att gca ggg gcg ttt gat tgg gca gtg   288
Ala Gln Ile Leu Lys Asp Thr Ile Ala Gly Ala Phe Asp Trp Ala Val
                85                  90                  95

gat aaa gat att tct gtc acg cta gtg aaa gat att att gaa gca atc   336
Asp Lys Asp Ile Ser Val Thr Leu Val Lys Asp Ile Ile Glu Ala Ile
            100                 105                 110

aat gcg aag tgg cgt gat tac acc aca aaa ggc tac tta att ggc ggt   384
Asn Ala Lys Trp Arg Asp Tyr Thr Thr Lys Gly Tyr Leu Ile Gly Gly
        115                 120                 125

aaa gcg tgg ctt aat aaa gag ctt aac agt gca acg aat tta aaa gat   432
Lys Ala Trp Leu Asn Lys Glu Leu Asn Ser Ala Thr Asn Leu Lys Asp
    130                 135                 140

gcg aag ttg ttg atc tct tat gat tat cac cca gta cca ccg ctc gaa   480
Ala Lys Leu Leu Ile Ser Tyr Asp Tyr His Pro Val Pro Pro Leu Glu
145                 150                 155                 160

cag cta ggc ttt aat cag tac att tct gat gaa tac ctt gtt gat ttt   528
Gln Leu Gly Phe Asn Gln Tyr Ile Ser Asp Glu Tyr Leu Val Asp Phe
                165                 170                 175

tca aat cgt tta gca tcg ta                                       548
Ser Asn Arg Leu Ala Ser
            180
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<210> 121
<211> 182

<212> PRT
<213> Pasteurella multocida

<400> 121
Met Arg Ala Tyr Leu Asp Lys Glu Gln Gly Trp His Thr Ser Ile Ser
1 5 10 15

Asn Lys Gly Ile Asn Gly Val Ser Gly Val Thr Gln Pro Leu Tyr Phe
20 25 30

Asp Ile Asn Asp Ser Ser Thr Asp Val Asn Tyr Leu Asn Glu Gln Gly
35 40 45

Ile Thr Cys Cys Val Asn His Asn Gly Phe Arg Phe Trp Gly Leu Arg
50 55 60

Thr Thr Ala Glu Asp Pro Leu Phe Lys Phe Glu Val Tyr Thr Arg Thr
65 70 75 80

Ala Gln Ile Leu Lys Asp Thr Ile Ala Gly Ala Phe Asp Trp Ala Val
85 90 95

Asp Lys Asp Ile Ser Val Thr Leu Val Lys Asp Ile Ile Glu Ala Ile
100 105 110

Asn Ala Lys Trp Arg Asp Tyr Thr Thr Lys Gly Tyr Leu Ile Gly Gly
115 120 125

Lys Ala Trp Leu Asn Lys Glu Leu Asn Ser Ala Thr Asn Leu Lys Asp
130 135 140

Ala Lys Leu Leu Ile Ser Tyr Asp Tyr His Pro Val Pro Pro Leu Glu
145 150 155 160

Gln Leu Gly Phe Asn Gln Tyr Ile Ser Asp Glu Tyr Leu Val Asp Phe
165 170 175

Ser Asn Arg Leu Ala Ser
180

<210> 122
<211> 69
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> apvA-or1

<220>
<221> CDS
<222> (1)..(69)

<400> 122
atg ttt tat gtc atg ctt gcc aat agg acg tct ata att tca tca atc 48
Met Phe Tyr Val Met Leu Ala Asn Arg Thr Ser Ile Ile Ser Ser Ile
1 5 10 15

gat aag ttt aag ata ctt agc 69
Asp Lys Phe Lys Ile Leu Ser
20

<210> 123
<211> 23
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 123
Met Phe Tyr Val Met Leu Ala Asn Arg Thr Ser Ile Ile Ser Ser Ile
1 5 10 15

Asp Lys Phe Lys Ile Leu Ser
20

<210> 124
<211> 64
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> apvA-or2

<220>
<221> CDS
<222> (3)..(62)

<400> 124
ag cta agt atc tta aac tta tcg att gat gaa att ata gac gtc cta 47
Leu Ser Ile Leu Asn Leu Ser Ile Asp Glu Ile Ile Asp Val Leu
1 5 10 15

ttg gca agc atg aca ta 64
Leu Ala Ser Met Thr
20

<210> 125
<211> 20
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 125
Leu Ser Ile Leu Asn Leu Ser Ile Asp Glu Ile Ile Asp Val Leu Leu
1 5 10 15

Ala Ser Met Thr
20

<210> 126
<211> 653
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> apvB

<220>
<221> CDS
<222> (1)..(651)

<400> 126
tta att agc ttt cct ttt att act ttt gca agt aat gtt aat gga gcc 48
Leu Ile Ser Phe Pro Phe Ile Thr Phe Ala Ser Asn Val Asn Gly Ala

```
  1               5                  10                  15

gaa att gga ttg gga gga gcc cgt gag agt agt att tac tat tct aaa   96
Glu Ile Gly Leu Gly Gly Ala Arg Glu Ser Ser Ile Tyr Tyr Ser Lys
            20                  25                  30

cat aaa gta gca aca aat ccc ttt tta gca ctt gat ctt tct tta ggt   144
His Lys Val Ala Thr Asn Pro Phe Leu Ala Leu Asp Leu Ser Leu Gly
        35                  40                  45

aat ttt tat atg aga ggg act gca gga att agc gaa ata gga tat gaa   192
Asn Phe Tyr Met Arg Gly Thr Ala Gly Ile Ser Glu Ile Gly Tyr Glu
    50                  55                  60

caa tct ttc act gac aat ttc agc gta tca ctg ttt gtt aac cca ttt   240
Gln Ser Phe Thr Asp Asn Phe Ser Val Ser Leu Phe Val Asn Pro Phe
65                  70                  75                  80

gat ggt ttt tca att aaa gga aaa gac ttg tta cct gga tat caa agt   288
Asp Gly Phe Ser Ile Lys Gly Lys Asp Leu Leu Pro Gly Tyr Gln Ser
                85                  90                  95

att caa act cgc aaa act caa ttt gcc ttt ggt tgg gga tta aat tat   336
Ile Gln Thr Arg Lys Thr Gln Phe Ala Phe Gly Trp Gly Leu Asn Tyr
            100                 105                 110


aat ttg gga ggt tta ttc ggc tta aat gat act ttt ata tcc ttg gaa   384
Asn Leu Gly Gly Leu Phe Gly Leu Asn Asp Thr Phe Ile Ser Leu Glu
        115                 120                 125

gga aaa agc gga aaa cgt ggt gcg agt agt aat gtc agc tta ctt aaa   432
Gly Lys Ser Gly Lys Arg Gly Ala Ser Ser Asn Val Ser Leu Leu Lys
    130                 135                 140

tcg ttt aat atg acg aaa aat tgg aaa gtt tca cca tat att ggc tca   480
Ser Phe Asn Met Thr Lys Asn Trp Lys Val Ser Pro Tyr Ile Gly Ser
145                 150                 155                 160

agt tat tat tca tct aaa tat aca gat tat tac ttt ggt att aaa caa   528
Ser Tyr Tyr Ser Ser Lys Tyr Thr Asp Tyr Tyr Phe Gly Ile Lys Gln
                165                 170                 175

tcc gaa tta ggt aat aaa att aca tcc gta tat aaa cct aaa gca gct   576
Ser Glu Leu Gly Asn Lys Ile Thr Ser Val Tyr Lys Pro Lys Ala Ala
            180                 185                 190

tat gca aca cac ata ggt att aat act gat tat gct ttc acg aac aat   624
Tyr Ala Thr His Ile Gly Ile Asn Thr Asp Tyr Ala Phe Thr Asn Asn
        195                 200                 205

ctt ggc atg ggt tta tct gtc ggt tgg at                           653
Leu Gly Met Gly Leu Ser Val Gly Trp
    210                 215
```

<210> 127
<211> 217
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 127

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Leu Ile Ser Phe Pro Phe Ile Thr Phe Ala Ser Asn Val Asn Gly Ala
  1               5                  10                  15

Glu Ile Gly Leu Gly Gly Ala Arg Glu Ser Ser Ile Tyr Tyr Ser Lys
             20                  25                  30

His Lys Val Ala Thr Asn Pro Phe Leu Ala Leu Asp Leu Ser Leu Gly
         35                  40                  45

Asn Phe Tyr Met Arg Gly Thr Ala Gly Ile Ser Glu Ile Gly Tyr Glu
     50                  55                  60

Gln Ser Phe Thr Asp Asn Phe Ser Val Ser Leu Phe Val Asn Pro Phe
 65                  70                  75                  80

Asp Gly Phe Ser Ile Lys Gly Lys Asp Leu Leu Pro Gly Tyr Gln Ser
                 85                  90                  95

Ile Gln Thr Arg Lys Thr Gln Phe Ala Phe Gly Trp Gly Leu Asn Tyr
            100                 105                 110

Asn Leu Gly Gly Leu Phe Gly Leu Asn Asp Thr Phe Ile Ser Leu Glu
        115                 120                 125

Gly Lys Ser Gly Lys Arg Gly Ala Ser Ser Asn Val Ser Leu Leu Lys
    130                 135                 140

Ser Phe Asn Met Thr Lys Asn Trp Lys Val Ser Pro Tyr Ile Gly Ser
145                 150                 155                 160

Ser Tyr Tyr Ser Ser Lys Tyr Thr Asp Tyr Tyr Phe Gly Ile Lys Gln
                165                 170                 175

Ser Glu Leu Gly Asn Lys Ile Thr Ser Val Tyr Lys Pro Lys Ala Ala
            180                 185                 190

Tyr Ala Thr His Ile Gly Ile Asn Thr Asp Tyr Ala Phe Thr Asn Asn
        195                 200                 205

Leu Gly Met Gly Leu Ser Val Gly Trp
    210                 215
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<210> 128
<211> 242
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> apvC

<220>
<221> CDS
<222> (1)..(240)

<400> 128

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atg tgg cgg atg gga gat ttt atg tct aaa aaa gag agg ctg aat gat   48
Met Trp Arg Met Gly Asp Phe Met Ser Lys Lys Glu Arg Leu Asn Asp
  1               5                  10                  15

atg gct cgc cag att tta tca gcg gcg gag ttg ctc att gca aag gaa   96
Met Ala Arg Gln Ile Leu Ser Ala Ala Glu Leu Leu Ile Ala Lys Glu
             20                  25                  30
```

```
ggt ttg caa aat tta tcg atg agg aaa atc gca agt gaa gcc ggt atc   144
Gly Leu Gln Asn Leu Ser Met Arg Lys Ile Ala Ser Glu Ala Gly Ile
          35                  40                  45

gca aca ggc acg ctt tat ctc tat ttc aaa acg aaa gac gag tta ctg   192
Ala Thr Gly Thr Leu Tyr Leu Tyr Phe Lys Thr Lys Asp Glu Leu Leu
      50                  55                  60

gat tgt ttg gcg gaa caa tta cat gaa cga tat tat cgt tat ctg aat   240
Asp Cys Leu Ala Glu Gln Leu His Glu Arg Tyr Tyr Arg Tyr Leu Asn
 65                  70                  75                  80

at                                                              242
```

<210> 129
<211> 80
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 129

```
Met Trp Arg Met Gly Asp Phe Met Ser Lys Lys Glu Arg Leu Asn Asp
  1               5                  10                  15

Met Ala Arg Gln Ile Leu Ser Ala Ala Glu Leu Leu Ile Ala Lys Glu
             20                  25                  30

Gly Leu Gln Asn Leu Ser Met Arg Lys Ile Ala Ser Glu Ala Gly Ile
          35                  40                  45

Ala Thr Gly Thr Leu Tyr Leu Tyr Phe Lys Thr Lys Asp Glu Leu Leu
      50                  55                  60

Asp Cys Leu Ala Glu Gln Leu His Glu Arg Tyr Tyr Arg Tyr Leu Asn
 65                  70                  75                  80
```

<210> 130
<211> 527
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> apvD

<220>
<221> CDS
<222> (1)..(525)

<400> 130

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aat att caa aaa aca gtt att gct agc ggc aca ttg caa gcg act gaa   48
Asn Ile Gln Lys Thr Val Ile Ala Ser Gly Thr Leu Gln Ala Thr Glu
  1               5                  10                  15

caa gta gat att ggt gca caa gta tct ggg cag att aag cat att tta   96
Gln Val Asp Ile Gly Ala Gln Val Ser Gly Gln Ile Lys His Ile Leu
             20                  25                  30

gta caa gaa gga cag aag gtt aaa aaa ggt gag cta tta gct gta att   144
Val Gln Glu Gly Gln Lys Val Lys Lys Gly Glu Leu Leu Ala Val Ile
          35                  40                  45

gat cca cgt ctg gct gaa acg gaa tta aaa cta gca aaa gct gag cta   192
```

```
Asp Pro Arg Leu Ala Glu Thr Glu Leu Lys Leu Ala Lys Ala Glu Leu
     50                  55                  60

gca aat gct tct gct aat ttg gat aca aaa aaa att aat ctt aag caa   240
Ala Asn Ala Ser Ala Asn Leu Asp Thr Lys Lys Ile Asn Leu Lys Gln
 65                  70                  75                  80

ctg caa tca gat tgg gaa cgt cat caa cgt ttg ata cga acc aat gcg   288
Leu Gln Ser Asp Trp Glu Arg His Gln Arg Leu Ile Arg Thr Asn Ala
                 85                  90                  95

aca agc caa aag gaa aca gaa gaa gca aaa agt aga tta aat acg gcc   336
Thr Ser Gln Lys Glu Thr Glu Glu Ala Lys Ser Arg Leu Asn Thr Ala
            100                 105                 110

aaa gca gaa ctt caa att gcg caa aat aat cta gat atc gct aaa atc   384
Lys Ala Glu Leu Gln Ile Ala Gln Asn Asn Leu Asp Ile Ala Lys Ile
        115                 120                 125

aga gtg gaa aaa gct gaa acc gaa cta gga tat aca gaa att cgt tct   432
Arg Val Glu Lys Ala Glu Thr Glu Leu Gly Tyr Thr Glu Ile Arg Ser
    130                 135                 140

cca ctt gat gca aca gta att tca gta ttt gcg caa aat ggt caa act   480
Pro Leu Asp Ala Thr Val Ile Ser Val Phe Ala Gln Asn Gly Gln Thr
145                 150                 155                 160

tta gtc acc acc caa caa gta cca gtg ctg atg aaa tta gct aat at    527
Leu Val Thr Thr Gln Gln Val Pro Val Leu Met Lys Leu Ala Asn
                165                 170                 175
```

<210> 131
<211> 175
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 131

```
Asn Ile Gln Lys Thr Val Ile Ala Ser Gly Thr Leu Gln Ala Thr Glu
  1               5                  10                  15

Gln Val Asp Ile Gly Ala Gln Val Ser Gly Gln Ile Lys His Ile Leu
             20                  25                  30

Val Gln Glu Gly Gln Lys Val Lys Lys Gly Glu Leu Leu Ala Val Ile
         35                  40                  45

Asp Pro Arg Leu Ala Glu Thr Glu Leu Lys Leu Ala Lys Ala Glu Leu
     50                  55                  60

Ala Asn Ala Ser Ala Asn Leu Asp Thr Lys Lys Ile Asn Leu Lys Gln
 65                  70                  75                  80

Leu Gln Ser Asp Trp Glu Arg His Gln Arg Leu Ile Arg Thr Asn Ala
                 85                  90                  95

Thr Ser Gln Lys Glu Thr Glu Glu Ala Lys Ser Arg Leu Asn Thr Ala
            100                 105                 110

Lys Ala Glu Leu Gln Ile Ala Gln Asn Asn Leu Asp Ile Ala Lys Ile
        115                 120                 125

Arg Val Glu Lys Ala Glu Thr Glu Leu Gly Tyr Thr Glu Ile Arg Ser
```

```
    130                 135                 140

Pro Leu Asp Ala Thr Val Ile Ser Val Phe Ala Gln Asn Gly Gln Thr
145                 150                 155                 160

Leu Val Thr Thr Gln Gln Val Pro Val Leu Met Lys Leu Ala Asn
                165                 170                 175


<210> 132
<211> 867
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> atpG

<220>
<221> CDS
<222> (1)..(864)

<400> 132
atg gca ggt gcg aaa gag ata aga acc aaa att gca agt gtg aaa aat   48
Met Ala Gly Ala Lys Glu Ile Arg Thr Lys Ile Ala Ser Val Lys Asn
  1               5                  10                  15

act caa aaa atc acc aaa gca atg gaa atg gtt gct acc tct aaa atg   96
Thr Gln Lys Ile Thr Lys Ala Met Glu Met Val Ala Thr Ser Lys Met
             20                  25                  30

cgt aaa acg caa gag cgt atg gct gcc agt cgt cct tat tcg gaa aca   144
Arg Lys Thr Gln Glu Arg Met Ala Ala Ser Arg Pro Tyr Ser Glu Thr
         35                  40                  45

atc cgt aag gtg att agc cat att gcg aaa gga agc att ggt tat aag   192
Ile Arg Lys Val Ile Ser His Ile Ala Lys Gly Ser Ile Gly Tyr Lys
     50                  55                  60

cac ccg ttt tta act gaa cgt gat att aaa aaa gta ggc tat ctt gtc   240
His Pro Phe Leu Thr Glu Arg Asp Ile Lys Lys Val Gly Tyr Leu Val
 65                  70                  75                  80

gtt tcg acc gat cgc ggt tta tgc ggt ggc ctt aat atc aat tta ttc   288
Val Ser Thr Asp Arg Gly Leu Cys Gly Gly Leu Asn Ile Asn Leu Phe
                 85                  90                  95

aaa gcg act ttg aat gaa ttt aaa acg tgg aaa gat aaa gac gtt agt   336
Lys Ala Thr Leu Asn Glu Phe Lys Thr Trp Lys Asp Lys Asp Val Ser
            100                 105                 110

gtt gag ctt ggt tta gta ggg tcg aaa ggc gta agc ttt tac caa aat   384
Val Glu Leu Gly Leu Val Gly Ser Lys Gly Val Ser Phe Tyr Gln Asn
        115                 120                 125

cta ggc tta aac gtg aga tct caa gta acg gga tta ggc gat aat ccg   432
Leu Gly Leu Asn Val Arg Ser Gln Val Thr Gly Leu Gly Asp Asn Pro
    130                 135                 140

gaa atg gaa cgt atc gtg ggc gca gtt aat gaa atg att aat gcg ttc   480
Glu Met Glu Arg Ile Val Gly Ala Val Asn Glu Met Ile Asn Ala Phe
145                 150                 155                 160

cga aac gga gaa gtg gat gcg gtt tac gtc gct tac aac cgt ttt gaa   528
```

```
Arg Asn Gly Glu Val Asp Ala Val Tyr Val Ala Tyr Asn Arg Phe Glu
                165                 170                 175

aat acg atg tca caa aaa cct gtt atc gca cag tta ctt ccg tta cct   576
Asn Thr Met Ser Gln Lys Pro Val Ile Ala Gln Leu Leu Pro Leu Pro
            180                 185                 190

aaa cta gat gac gat gaa tta gat acg aaa ggt tca tgg gat tat att   624
Lys Leu Asp Asp Asp Glu Leu Asp Thr Lys Gly Ser Trp Asp Tyr Ile
        195                 200                 205

tat gaa ccg aat cca caa gtt tta ttg gat agt tta ctt gtt cgt tat   672
Tyr Glu Pro Asn Pro Gln Val Leu Leu Asp Ser Leu Leu Val Arg Tyr
    210                 215                 220

tta gaa act cag gta tac caa gca gtt gta gat aac cta gct tct gaa   720
Leu Glu Thr Gln Val Tyr Gln Ala Val Val Asp Asn Leu Ala Ser Glu
225                 230                 235                 240

caa gcc gct cga atg gta gcg atg aaa gcc gca aca gat aat gcg ggt   768
Gln Ala Ala Arg Met Val Ala Met Lys Ala Ala Thr Asp Asn Ala Gly
                245                 250                 255

aca tta atc gat gaa tta caa tta gtg tat aac aaa gct cgc caa gca   816
Thr Leu Ile Asp Glu Leu Gln Leu Val Tyr Asn Lys Ala Arg Gln Ala
            260                 265                 270

agc att aca aat gaa tta aac gaa att gtt gcg ggt gcc gca gca att   864
Ser Ile Thr Asn Glu Leu Asn Glu Ile Val Ala Gly Ala Ala Ala Ile
        275                 280                 285

taa                                                              867


<210> 133
<211> 288
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 133
Met Ala Gly Ala Lys Glu Ile Arg Thr Lys Ile Ala Ser Val Lys Asn
  1               5                  10                  15

Thr Gln Lys Ile Thr Lys Ala Met Glu Met Val Ala Thr Ser Lys Met
             20                  25                  30

Arg Lys Thr Gln Glu Arg Met Ala Ala Ser Arg Pro Tyr Ser Glu Thr
         35                  40                  45

Ile Arg Lys Val Ile Ser His Ile Ala Lys Gly Ser Ile Gly Tyr Lys
     50                  55                  60

His Pro Phe Leu Thr Glu Arg Asp Ile Lys Lys Val Gly Tyr Leu Val
 65                  70                  75                  80

Val Ser Thr Asp Arg Gly Leu Cys Gly Gly Leu Asn Ile Asn Leu Phe
                 85                  90                  95

Lys Ala Thr Leu Asn Glu Phe Lys Thr Trp Lys Asp Lys Asp Val Ser
            100                 105                 110

Val Glu Leu Gly Leu Val Gly Ser Lys Gly Val Ser Phe Tyr Gln Asn
        115                 120                 125
```

```
Leu Gly Leu Asn Val Arg Ser Gln Val Thr Gly Leu Gly Asp Asn Pro
    130                 135                 140

Glu Met Glu Arg Ile Val Gly Ala Val Asn Glu Met Ile Asn Ala Phe
145                 150                 155                 160

Arg Asn Gly Glu Val Asp Ala Val Tyr Val Ala Tyr Asn Arg Phe Glu
                165                 170                 175

Asn Thr Met Ser Gln Lys Pro Val Ile Ala Gln Leu Leu Pro Leu Pro
            180                 185                 190

Lys Leu Asp Asp Asp Glu Leu Asp Thr Lys Gly Ser Trp Asp Tyr Ile
        195                 200                 205


Tyr Glu Pro Asn Pro Gln Val Leu Leu Asp Ser Leu Leu Val Arg Tyr
    210                 215                 220

Leu Glu Thr Gln Val Tyr Gln Ala Val Val Asp Asn Leu Ala Ser Glu
225                 230                 235                 240

Gln Ala Ala Arg Met Val Ala Met Lys Ala Ala Thr Asp Asn Ala Gly
                245                 250                 255

Thr Leu Ile Asp Glu Leu Gln Leu Val Tyr Asn Lys Ala Arg Gln Ala
            260                 265                 270

Ser Ile Thr Asn Glu Leu Asn Glu Ile Val Ala Gly Ala Ala Ala Ile
        275                 280                 285


<210> 134
<211> 534
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> atpH

<220>
<221> CDS
<222> (1)..(531)

<400> 134
atg tca gaa tta agt aca gta gct cgc ccc tac gct aaa gca gct ttt   48
Met Ser Glu Leu Ser Thr Val Ala Arg Pro Tyr Ala Lys Ala Ala Phe
  1               5                  10                  15

gat ttt gct tta gaa caa ggt cag ttg gac aaa tgg caa gaa atg tta   96
Asp Phe Ala Leu Glu Gln Gly Gln Leu Asp Lys Trp Gln Glu Met Leu
             20                  25                  30

cag ttt tcg gca ttc gtt gct gaa aac gaa caa gtg gcg gaa tat att   144
Gln Phe Ser Ala Phe Val Ala Glu Asn Glu Gln Val Ala Glu Tyr Ile
         35                  40                  45

aat tct tcc ctt gca agc ggt cag att tct gaa act ttt atc aaa atc   192
Asn Ser Ser Leu Ala Ser Gly Gln Ile Ser Glu Thr Phe Ile Lys Ile
     50                  55                  60

tgc ggc gac caa ctt gat caa tat ggg caa aat ttt att cgt gta atg   240
Cys Gly Asp Gln Leu Asp Gln Tyr Gly Gln Asn Phe Ile Arg Val Met
```

```
 65                  70                  75                  80

gct gaa aat aaa cgt ctg gct gtg ttg cct atg gtt ttt gat act ttc   288
Ala Glu Asn Lys Arg Leu Ala Val Leu Pro Met Val Phe Asp Thr Phe
                85                  90                  95

gta tca tta cga gcg gaa cat gaa gcg gta aaa gat gta aca att gtt   336
Val Ser Leu Arg Ala Glu His Glu Ala Val Lys Asp Val Thr Ile Val
            100                 105                 110

tcg gca aac gaa tta agt caa gca caa gaa gat aaa atc gca aaa gcg   384
Ser Ala Asn Glu Leu Ser Gln Ala Gln Glu Asp Lys Ile Ala Lys Ala
        115                 120                 125

atg gaa aaa cgc tta ggt caa aaa gtt cgt tta acc aac caa atc gat   432
Met Glu Lys Arg Leu Gly Gln Lys Val Arg Leu Thr Asn Gln Ile Asp
    130                 135                 140

aac agc ctg att gca ggc gta att att aaa tac gat gat gtt gtt att   480
Asn Ser Leu Ile Ala Gly Val Ile Ile Lys Tyr Asp Asp Val Val Ile
145                 150                 155                 160

gat ggt agt agc cgc ggt cag tta aat cgc tta gcg tca gcg ttg agc   528
Asp Gly Ser Ser Arg Gly Gln Leu Asn Arg Leu Ala Ser Ala Leu Ser
                165                 170                 175

ttg taa                                                         534
Leu
```

<210> 135
<211> 177
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 135

```
Met Ser Glu Leu Ser Thr Val Ala Arg Pro Tyr Ala Lys Ala Ala Phe
  1               5                  10                  15

Asp Phe Ala Leu Glu Gln Gly Gln Leu Asp Lys Trp Gln Glu Met Leu
             20                  25                  30

Gln Phe Ser Ala Phe Val Ala Glu Asn Glu Gln Val Ala Glu Tyr Ile
         35                  40                  45

Asn Ser Ser Leu Ala Ser Gly Gln Ile Ser Glu Thr Phe Ile Lys Ile
     50                  55                  60

Cys Gly Asp Gln Leu Asp Gln Tyr Gly Gln Asn Phe Ile Arg Val Met
 65                  70                  75                  80

Ala Glu Asn Lys Arg Leu Ala Val Leu Pro Met Val Phe Asp Thr Phe
                85                  90                  95

Val Ser Leu Arg Ala Glu His Glu Ala Val Lys Asp Val Thr Ile Val
            100                 105                 110

Ser Ala Asn Glu Leu Ser Gln Ala Gln Glu Asp Lys Ile Ala Lys Ala
        115                 120                 125

Met Glu Lys Arg Leu Gly Gln Lys Val Arg Leu Thr Asn Gln Ile Asp
    130                 135                 140
```

```
Asn Ser Leu Ile Ala Gly Val Ile Ile Lys Tyr Asp Asp Val Val Ile
145                 150                 155                 160

Asp Gly Ser Ser Arg Gly Gln Leu Asn Arg Leu Ala Ser Ala Leu Ser
                165                 170                 175

Leu
```

<210> 136
<211> 321
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> dksA

<220>
<221> CDS
<222> (1)..(318)

<400> 136

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gca tgg cat gtg caa att atg gac gaa gct gag cgt aca aaa aac caa   48
Ala Trp His Val Gln Ile Met Asp Glu Ala Glu Arg Thr Lys Asn Gln
  1               5                  10                  15

atg cag gaa gaa gtc gct aat ttc gcc gat cct gcg gac cgc gcc act   96
Met Gln Glu Glu Val Ala Asn Phe Ala Asp Pro Ala Asp Arg Ala Thr
             20                  25                  30

cag gaa gaa gaa ttc agt ctt gaa tta aga aac cgt gac cgt gag cgt   144
Gln Glu Glu Glu Phe Ser Leu Glu Leu Arg Asn Arg Asp Arg Glu Arg
         35                  40                  45

aaa ttg ctt aag aag att gag caa acg tta aat agc att gcc gaa gac   192
Lys Leu Leu Lys Lys Ile Glu Gln Thr Leu Asn Ser Ile Ala Glu Asp
     50                  55                  60

gaa tac ggc tat tgc gaa act tgc ggt gtt gaa atc ggt tta cgt cgt   240
Glu Tyr Gly Tyr Cys Glu Thr Cys Gly Val Glu Ile Gly Leu Arg Arg
 65                  70                  75                  80

tta gaa gcg cgc ccg acc gcg gat atg tgt atc gat tgc aaa aca ctt   288
Leu Glu Ala Arg Pro Thr Ala Asp Met Cys Ile Asp Cys Lys Thr Leu
                 85                  90                  95

gcg gaa atc cgt gaa aag caa atg ggc tta taa                      321
Ala Glu Ile Arg Glu Lys Gln Met Gly Leu
            100                 105
```

<210> 137
<211> 106
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 137

```
Ala Trp His Val Gln Ile Met Asp Glu Ala Glu Arg Thr Lys Asn Gln
  1               5                  10                  15

Met Gln Glu Glu Val Ala Asn Phe Ala Asp Pro Ala Asp Arg Ala Thr
             20                  25                  30
```

```
Gln Glu Glu Glu Phe Ser Leu Glu Leu Arg Asn Arg Asp Arg Glu Arg
         35                  40                  45

Lys Leu Leu Lys Lys Ile Glu Gln Thr Leu Asn Ser Ile Ala Glu Asp
     50                  55                  60

Glu Tyr Gly Tyr Cys Glu Thr Cys Gly Val Glu Ile Gly Leu Arg Arg
 65                  70                  75                  80

Leu Glu Ala Arg Pro Thr Ala Asp Met Cys Ile Asp Cys Lys Thr Leu
                 85                  90                  95

Ala Glu Ile Arg Glu Lys Gln Met Gly Leu
            100                 105


<210> 138
<211> 33
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> dnaK

<220>
<221> CDS
<222> (1)..(30)

<400> 138
gct gag ttt gaa gaa gtg aaa gat aat aaa taa                          33
Ala Glu Phe Glu Glu Val Lys Asp Asn Lys
  1               5                  10


<210> 139
<211> 10
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 139
Ala Glu Phe Glu Glu Val Lys Asp Asn Lys
  1               5                  10


<210> 140
<211> 453
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> exbB

<220>
<221> CDS
<222> (1)..(450)

<400> 140
atg gaa caa atg ctt gaa ctt tta caa ggt cat gtt gat tat att att   48
Met Glu Gln Met Leu Glu Leu Leu Gln Gly His Val Asp Tyr Ile Ile
  1               5                  10                  15

tta ggc tta tta cta tta atg agt gtt gtg ttg gta tgg aaa att att   96
Leu Gly Leu Leu Leu Leu Met Ser Val Val Leu Val Trp Lys Ile Ile
```

```
             20                  25                  30

gaa cgc gta ctt ttc tac aaa caa ttg gat gtg acc aaa tat gac acg   144
Glu Arg Val Leu Phe Tyr Lys Gln Leu Asp Val Thr Lys Tyr Asp Thr
         35                  40                  45


cta caa gat ttg gaa att gat acc act cgc aat tta acc acc att tcc   192
Leu Gln Asp Leu Glu Ile Asp Thr Thr Arg Asn Leu Thr Thr Ile Ser
     50                  55                  60

act atc ggt gcc aac gcc cct tat atc ggt tta tta gga acc gta tta   240
Thr Ile Gly Ala Asn Ala Pro Tyr Ile Gly Leu Leu Gly Thr Val Leu
 65                  70                  75                  80

ggg atc tta ctt acc ttc tat cat tta ggg cat tcc ggc ggt gat att   288
Gly Ile Leu Leu Thr Phe Tyr His Leu Gly His Ser Gly Gly Asp Ile
                 85                  90                  95

gac gcc gca tcc att atg gtt cac ctt tcg ctt gca tta aaa gca acc   336
Asp Ala Ala Ser Ile Met Val His Leu Ser Leu Ala Leu Lys Ala Thr
            100                 105                 110

gca gcc ggt atc tta gtc gct att ccg gca atg atg ttc tac agc ggt   384
Ala Ala Gly Ile Leu Val Ala Ile Pro Ala Met Met Phe Tyr Ser Gly
        115                 120                 125

ttt aac cgt aaa gtg gat gaa agc aaa ctt aaa tgg caa gcg att caa   432
Phe Asn Arg Lys Val Asp Glu Ser Lys Leu Lys Trp Gln Ala Ile Gln
    130                 135                 140

gct cgt aaa gcc aat caa taa                                     453
Ala Arg Lys Ala Asn Gln
145                 150


<210> 141
<211> 150
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 141
Met Glu Gln Met Leu Glu Leu Leu Gln Gly His Val Asp Tyr Ile Ile
  1               5                  10                  15

Leu Gly Leu Leu Leu Leu Met Ser Val Val Leu Val Trp Lys Ile Ile
             20                  25                  30

Glu Arg Val Leu Phe Tyr Lys Gln Leu Asp Val Thr Lys Tyr Asp Thr
         35                  40                  45

Leu Gln Asp Leu Glu Ile Asp Thr Thr Arg Asn Leu Thr Thr Ile Ser
     50                  55                  60

Thr Ile Gly Ala Asn Ala Pro Tyr Ile Gly Leu Leu Gly Thr Val Leu
 65                  70                  75                  80

Gly Ile Leu Leu Thr Phe Tyr His Leu Gly His Ser Gly Gly Asp Ile
                 85                  90                  95

Asp Ala Ala Ser Ile Met Val His Leu Ser Leu Ala Leu Lys Ala Thr
            100                 105                 110
```

```
Ala Ala Gly Ile Leu Val Ala Ile Pro Ala Met Met Phe Tyr Ser Gly
        115                 120                 125

Phe Asn Arg Lys Val Asp Glu Ser Lys Leu Lys Trp Gln Ala Ile Gln
    130                 135                 140

Ala Arg Lys Ala Asn Gln
145                 150


<210> 142
<211> 720
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> fkpA

<220>
<221> CDS
<222> (1)..(717)

<400> 142
atg tta aaa aat aaa ctt tct gtt ctt gca atc gta gcc ggt acg ttc   48
Met Leu Lys Asn Lys Leu Ser Val Leu Ala Ile Val Ala Gly Thr Phe
  1               5                  10                  15

gtt tca gct caa act gca ttt gca gcg gat caa aaa ttc att gac gat   96
Val Ser Ala Gln Thr Ala Phe Ala Ala Asp Gln Lys Phe Ile Asp Asp
             20                  25                  30

tca tca tat gca gtc ggc gta ttg atg ggt aaa aat atc gaa ggc gtc   144
Ser Ser Tyr Ala Val Gly Val Leu Met Gly Lys Asn Ile Glu Gly Val
         35                  40                  45

gtt gaa tca caa aaa gaa att ttt tct tat aac caa gat aaa atc ttg   192
Val Glu Ser Gln Lys Glu Ile Phe Ser Tyr Asn Gln Asp Lys Ile Leu
     50                  55                  60

gcg ggt gtc caa gat acc atc aaa aaa acc ggt aaa tta acc gat gaa   240
Ala Gly Val Gln Asp Thr Ile Lys Lys Thr Gly Lys Leu Thr Asp Glu
 65                  70                  75                  80

gat cta caa aaa caa tta aaa tcg ctt gat act tat ctt gca agt caa   288
Asp Leu Gln Lys Gln Leu Lys Ser Leu Asp Thr Tyr Leu Ala Ser Gln
                 85                  90                  95

gaa agc aaa att gcg gcg gag aaa agc aaa gca acc gta gaa gcc ggt   336
Glu Ser Lys Ile Ala Ala Glu Lys Ser Lys Ala Thr Val Glu Ala Gly
            100                 105                 110

aat aaa ttt cgt acc gac tac gaa aaa caa agc ggc gtg aaa aaa acc   384
Asn Lys Phe Arg Thr Asp Tyr Glu Lys Gln Ser Gly Val Lys Lys Thr
        115                 120                 125

gct tcc ggt tta ctt tat aaa att gaa aaa gcc ggc acg ggc gaa tcg   432
Ala Ser Gly Leu Leu Tyr Lys Ile Glu Lys Ala Gly Thr Gly Glu Ser
    130                 135                 140

cct aaa gcg gaa gat acc gtt aaa gtt cac tat aaa ggg aca tta acc   480
Pro Lys Ala Glu Asp Thr Val Lys Val His Tyr Lys Gly Thr Leu Thr
145                 150                 155                 160
```

```
gat ggt acg gta ttc gat agc tca tac gat cgc ggt gag ccg att gaa   528
Asp Gly Thr Val Phe Asp Ser Ser Tyr Asp Arg Gly Glu Pro Ile Glu
                165                 170                 175

ttc caa tta aac caa tta att ccg ggt tgg att gaa gcg att cca atg   576
Phe Gln Leu Asn Gln Leu Ile Pro Gly Trp Ile Glu Ala Ile Pro Met
            180                 185                 190

ttg aaa aaa ggc gga aaa atg gaa atc gtc gtt ccg cct gaa ctt ggt   624
Leu Lys Lys Gly Gly Lys Met Glu Ile Val Val Pro Pro Glu Leu Gly
        195                 200                 205

tac ggc gaa cgc caa gca ggt aag att ccg gca agt tca acc tta aaa   672
Tyr Gly Glu Arg Gln Ala Gly Lys Ile Pro Ala Ser Ser Thr Leu Lys
    210                 215                 220

ttc gag att gaa ttg tta gat ttc aaa gcg gcc gaa gcg aaa aaa taa   720
Phe Glu Ile Glu Leu Leu Asp Phe Lys Ala Ala Glu Ala Lys Lys
225                 230                 235
```

<210> 143
<211> 239
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 143

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Met Leu Lys Asn Lys Leu Ser Val Leu Ala Ile Val Ala Gly Thr Phe
  1               5                  10                  15

Val Ser Ala Gln Thr Ala Phe Ala Ala Asp Gln Lys Phe Ile Asp Asp
             20                  25                  30

Ser Ser Tyr Ala Val Gly Val Leu Met Gly Lys Asn Ile Glu Gly Val
         35                  40                  45

Val Glu Ser Gln Lys Glu Ile Phe Ser Tyr Asn Gln Asp Lys Ile Leu
     50                  55                  60

Ala Gly Val Gln Asp Thr Ile Lys Lys Thr Gly Lys Leu Thr Asp Glu
 65                  70                  75                  80

Asp Leu Gln Lys Gln Leu Lys Ser Leu Asp Thr Tyr Leu Ala Ser Gln
                 85                  90                  95

Glu Ser Lys Ile Ala Ala Glu Lys Ser Lys Ala Thr Val Glu Ala Gly
            100                 105                 110

Asn Lys Phe Arg Thr Asp Tyr Glu Lys Gln Ser Gly Val Lys Lys Thr
        115                 120                 125

Ala Ser Gly Leu Leu Tyr Lys Ile Glu Lys Ala Gly Thr Gly Glu Ser
    130                 135                 140

Pro Lys Ala Glu Asp Thr Val Lys Val His Tyr Lys Gly Thr Leu Thr
145                 150                 155                 160

Asp Gly Thr Val Phe Asp Ser Ser Tyr Asp Arg Gly Glu Pro Ile Glu
                165                 170                 175

Phe Gln Leu Asn Gln Leu Ile Pro Gly Trp Ile Glu Ala Ile Pro Met
            180                 185                 190
```

```
Leu Lys Lys Gly Gly Lys Met Glu Ile Val Val Pro Pro Glu Leu Gly
        195                 200                 205

Tyr Gly Glu Arg Gln Ala Gly Lys Ile Pro Ala Ser Ser Thr Leu Lys
    210                 215                 220

Phe Glu Ile Glu Leu Leu Asp Phe Lys Ala Ala Glu Ala Lys Lys
225                 230                 235


<210> 144
<211> 290
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> HI0379

<220>
<221> CDS
<222> (3)..(287)

<400> 144
tg cat agc gtg aga ggt ccg ggc ggc ggt tat caa ctc ggt aag caa    47
   His Ser Val Arg Gly Pro Gly Gly Gly Tyr Gln Leu Gly Lys Gln
     1               5                  10                  15

cct gaa gag att agt gtg ggg atg att att gcg gcg gtg aat gaa aat   95
Pro Glu Glu Ile Ser Val Gly Met Ile Ile Ala Ala Val Asn Glu Asn
                20                  25                  30

ctc gac gta acc aaa tgt aaa ggt agc ggc aac tgt agc aaa aac tct   143
Leu Asp Val Thr Lys Cys Lys Gly Ser Gly Asn Cys Ser Lys Asn Ser
            35                  40                  45

cag tgc tta acc cat cat tta tgg gaa cgt tta gaa gaa caa atc ggt   191
Gln Cys Leu Thr His His Leu Trp Glu Arg Leu Glu Glu Gln Ile Gly
        50                  55                  60

gtg ttt tta aat acg att act tta gcg gaa ctt gtt gaa gaa cat tcg   239
Val Phe Leu Asn Thr Ile Thr Leu Ala Glu Leu Val Glu Glu His Ser
    65                  70                  75

gat cac gat tgt gaa aaa gaa cat tgc cac gat cat tca cac aaa cat   287
Asp His Asp Cys Glu Lys Glu His Cys His Asp His Ser His Lys His
80                  85                  90                  95

taa                                                             290


<210> 145
<211> 95
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 145
His Ser Val Arg Gly Pro Gly Gly Gly Tyr Gln Leu Gly Lys Gln Pro
  1               5                  10                  15

Glu Glu Ile Ser Val Gly Met Ile Ile Ala Ala Val Asn Glu Asn Leu
            20                  25                  30

Asp Val Thr Lys Cys Lys Gly Ser Gly Asn Cys Ser Lys Asn Ser Gln
```

```
         35                  40                  45

Cys Leu Thr His His Leu Trp Glu Arg Leu Glu Glu Gln Ile Gly Val
     50                  55                  60

Phe Leu Asn Thr Ile Thr Leu Ala Glu Leu Val Glu Glu His Ser Asp
 65                  70                  75                  80

His Asp Cys Glu Lys Glu His Cys His Asp His Ser His Lys His
                 85                  90                  95


<210> 146
<211> 273
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> hupA

<220>
<221> CDS
<222> (1)..(270)

<400> 146
atg aac aaa act gag tta atc gat gca atc gca gct ggt gca gag tta   48
Met Asn Lys Thr Glu Leu Ile Asp Ala Ile Ala Ala Gly Ala Glu Leu
  1               5                  10                  15

agc aag aaa gac gcg aaa gcg gca tta gaa gcg act tta aat gcg atc   96
Ser Lys Lys Asp Ala Lys Ala Ala Leu Glu Ala Thr Leu Asn Ala Ile
             20                  25                  30

tct gaa agc cta aaa aat ggc gac acc gtt cag tta atc ggc ttc ggt   144
Ser Glu Ser Leu Lys Asn Gly Asp Thr Val Gln Leu Ile Gly Phe Gly
         35                  40                  45

act ttt aaa gta aac gag cgt aat gca cgt acg ggt cgt aac ccg cgt   192
Thr Phe Lys Val Asn Glu Arg Asn Ala Arg Thr Gly Arg Asn Pro Arg
     50                  55                  60

acc ggc gaa gaa atc aaa atc gca gca tct aaa gtg ccg gcg ttt gtt   240
Thr Gly Glu Glu Ile Lys Ile Ala Ala Ser Lys Val Pro Ala Phe Val
 65                  70                  75                  80

gca ggt aaa gca tta aaa gat tta gta aaa taa                      273
Ala Gly Lys Ala Leu Lys Asp Leu Val Lys
                 85                  90


<210> 147
<211> 90
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 147
Met Asn Lys Thr Glu Leu Ile Asp Ala Ile Ala Ala Gly Ala Glu Leu
  1               5                  10                  15

Ser Lys Lys Asp Ala Lys Ala Ala Leu Glu Ala Thr Leu Asn Ala Ile
             20                  25                  30
```

```
Ser Glu Ser Leu Lys Asn Gly Asp Thr Val Gln Leu Ile Gly Phe Gly
         35                  40                  45

Thr Phe Lys Val Asn Glu Arg Asn Ala Arg Thr Gly Arg Asn Pro Arg
     50                  55                  60

Thr Gly Glu Glu Ile Lys Ile Ala Ala Ser Lys Val Pro Ala Phe Val
 65                  70                  75                  80

Ala Gly Lys Ala Leu Lys Asp Leu Val Lys
                 85                  90


<210> 148
<211> 551
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> lpdA

<220>
<221> CDS
<222> (1)..(549)

<400> 148
atg agc aaa gaa atc aaa acg caa gtc gtg gta ctt ggt gcg ggt cct   48
Met Ser Lys Glu Ile Lys Thr Gln Val Val Val Leu Gly Ala Gly Pro
  1               5                  10                  15

gcc ggt tat tca gcg gca ttc cgt tgt gcc gac tta ggc tta gaa aca   96
Ala Gly Tyr Ser Ala Ala Phe Arg Cys Ala Asp Leu Gly Leu Glu Thr
             20                  25                  30

gta att gtc gaa cgt tat tca act ttg ggc ggt gta tgc tta aac gta   144
Val Ile Val Glu Arg Tyr Ser Thr Leu Gly Gly Val Cys Leu Asn Val
         35                  40                  45

ggt tgt att ccg tct aaa gca tta tta cac gtt gca aaa gtt atc gaa   192
Gly Cys Ile Pro Ser Lys Ala Leu Leu His Val Ala Lys Val Ile Glu
     50                  55                  60

gaa gca aaa cac gca gag aaa aac ggt att act ttc ggt gag ccc aac   240
Glu Ala Lys His Ala Glu Lys Asn Gly Ile Thr Phe Gly Glu Pro Asn
 65                  70                  75                  80

att gat tta gat aaa gtg cgt gcg ggt aaa gaa gcg gtt gtt tct aaa   288
Ile Asp Leu Asp Lys Val Arg Ala Gly Lys Glu Ala Val Val Ser Lys
                 85                  90                  95

tta acc ggc ggt tta gcg ggt atg gct aaa gca cgt aaa gta aca gta   336
Leu Thr Gly Gly Leu Ala Gly Met Ala Lys Ala Arg Lys Val Thr Val
            100                 105                 110

gtg gaa ggt tta gcg gcg ttt acc gat ccg aat act tta gta gct cgt   384
Val Glu Gly Leu Ala Ala Phe Thr Asp Pro Asn Thr Leu Val Ala Arg
        115                 120                 125

gac cgt gac ggt aat ccg aca acg att aaa ttt gat tat gca att att   432
Asp Arg Asp Gly Asn Pro Thr Thr Ile Lys Phe Asp Tyr Ala Ile Ile
    130                 135                 140

gca gcc ggt tct cgt ccg att cag ctt ccg ttc att cca cac gaa gat   480
```

```
Ala Ala Gly Ser Arg Pro Ile Gln Leu Pro Phe Ile Pro His Glu Asp
145                 150                 155                 160

ccg cgt gtg tgg gat tct acg gat gca ctt aaa tta aaa gaa gta ccc   528
Pro Arg Val Trp Asp Ser Thr Asp Ala Leu Lys Leu Lys Glu Val Pro
                165                 170                 175

gaa aaa att act cat tat ggg cc                                   551
Glu Lys Ile Thr His Tyr Gly
            180
```

<210> 149
<211> 183
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 149

```
Met Ser Lys Glu Ile Lys Thr Gln Val Val Val Leu Gly Ala Gly Pro
  1               5                  10                  15

Ala Gly Tyr Ser Ala Ala Phe Arg Cys Ala Asp Leu Gly Leu Glu Thr
             20                  25                  30

Val Ile Val Glu Arg Tyr Ser Thr Leu Gly Gly Val Cys Leu Asn Val
         35                  40                  45

Gly Cys Ile Pro Ser Lys Ala Leu Leu His Val Ala Lys Val Ile Glu
     50                  55                  60

Glu Ala Lys His Ala Glu Lys Asn Gly Ile Thr Phe Gly Glu Pro Asn
 65                  70                  75                  80

Ile Asp Leu Asp Lys Val Arg Ala Gly Lys Glu Ala Val Val Ser Lys
                 85                  90                  95

Leu Thr Gly Gly Leu Ala Gly Met Ala Lys Ala Arg Lys Val Thr Val
            100                 105                 110

Val Glu Gly Leu Ala Ala Phe Thr Asp Pro Asn Thr Leu Val Ala Arg
        115                 120                 125

Asp Arg Asp Gly Asn Pro Thr Thr Ile Lys Phe Asp Tyr Ala Ile Ile
    130                 135                 140

Ala Ala Gly Ser Arg Pro Ile Gln Leu Pro Phe Ile Pro His Glu Asp
145                 150                 155                 160

Pro Arg Val Trp Asp Ser Thr Asp Ala Leu Lys Leu Lys Glu Val Pro
                165                 170                 175

Glu Lys Ile Thr His Tyr Gly
            180
```

<210> 150
<211> 1095
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> Omp5-2

<220>
<221> CDS
<222> (1)..(1092)

<400> 150

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atg aaa aaa tca tta gtt gct tta aca gta tta tcg gct gca gcg gta   48
Met Lys Lys Ser Leu Val Ala Leu Thr Val Leu Ser Ala Ala Ala Val
  1               5                  10                  15

gct caa gca gcg cca caa caa aat act ttc tac gca ggt gcg aaa gca   96
Ala Gln Ala Ala Pro Gln Gln Asn Thr Phe Tyr Ala Gly Ala Lys Ala
            20                  25                  30

ggt tgg gcg tca ttc cat gat ggt atc gaa caa tta gat tca gct aaa   144
Gly Trp Ala Ser Phe His Asp Gly Ile Glu Gln Leu Asp Ser Ala Lys
        35                  40                  45

aac aca gat cgc ggt aca aaa tac ggt atc aac cgt aat tca gta act   192
Asn Thr Asp Arg Gly Thr Lys Tyr Gly Ile Asn Arg Asn Ser Val Thr
    50                  55                  60

tac ggc gta ttc ggc ggt tac caa att tta aac caa gac aaa tta ggt   240
Tyr Gly Val Phe Gly Gly Tyr Gln Ile Leu Asn Gln Asp Lys Leu Gly
65                  70                  75                  80

tta gcg gct gaa tta ggt tat gac tat ttc ggt cgt gtg cgc ggt tct   288
Leu Ala Ala Glu Leu Gly Tyr Asp Tyr Phe Gly Arg Val Arg Gly Ser
                85                  90                  95

gaa aaa cca aac ggt aaa gcg gac aag aaa act ttc cgt cac gct gca   336
Glu Lys Pro Asn Gly Lys Ala Asp Lys Lys Thr Phe Arg His Ala Ala
            100                 105                 110

cac ggt gcg aca atc gca tta aaa cct agc tac gaa gta tta cct gac   384
His Gly Ala Thr Ile Ala Leu Lys Pro Ser Tyr Glu Val Leu Pro Asp
        115                 120                 125

tta gac gtt tac ggt aaa gta ggt atc gca tta gta aac aat aca tat   432
Leu Asp Val Tyr Gly Lys Val Gly Ile Ala Leu Val Asn Asn Thr Tyr
    130                 135                 140

aaa aca ttc aat gca gca caa gag aaa gtg aaa act cgt cgt ttc caa   480
Lys Thr Phe Asn Ala Ala Gln Glu Lys Val Lys Thr Arg Arg Phe Gln
145                 150                 155                 160

agt tct tta att tta ggt gcg ggt gtt gag tac gca att ctt cct gaa   528
Ser Ser Leu Ile Leu Gly Ala Gly Val Glu Tyr Ala Ile Leu Pro Glu
                165                 170                 175

tta gcg gca cgt gtt gaa tac caa tgg tta aac aac gca ggt aaa gca   576
Leu Ala Ala Arg Val Glu Tyr Gln Trp Leu Asn Asn Ala Gly Lys Ala
            180                 185                 190

agc tac tct act tta aat cgt atg ggt gca act gac tac cgt tcg gat   624
Ser Tyr Ser Thr Leu Asn Arg Met Gly Ala Thr Asp Tyr Arg Ser Asp
        195                 200                 205


atc agt tcc gta tct gca ggt tta agc tac cgt ttc ggt caa ggt gcg   672
Ile Ser Ser Val Ser Ala Gly Leu Ser Tyr Arg Phe Gly Gln Gly Ala
    210                 215                 220

gca ccg gtt gca gct ccg gca gtt gaa act aaa aac ttc gca ttc agc   720
```

```
Ala Pro Val Ala Ala Pro Ala Val Glu Thr Lys Asn Phe Ala Phe Ser
225                 230                 235                 240

tct gac gta tta ttc gca ttc ggt aaa tca aac tta aaa ccg gct gcg   768
Ser Asp Val Leu Phe Ala Phe Gly Lys Ser Asn Leu Lys Pro Ala Ala
                245                 250                 255

gca aca gca tta gat gca atg caa acc gaa atc aat aac gca ggt tta   816
Ala Thr Ala Leu Asp Ala Met Gln Thr Glu Ile Asn Asn Ala Gly Leu
            260                 265                 270

tca aat gct gcg atc caa gta aac ggt tac acg gac cgt atc ggt aaa   864
Ser Asn Ala Ala Ile Gln Val Asn Gly Tyr Thr Asp Arg Ile Gly Lys
        275                 280                 285

gaa gct tca aac tta aaa ctt tca caa cgt cgt gcg gaa aca gta gct   912
Glu Ala Ser Asn Leu Lys Leu Ser Gln Arg Arg Ala Glu Thr Val Ala
    290                 295                 300

aac tac atc gtt tct aaa ggt gct ccg gca gct aac gta act gca gta   960
Asn Tyr Ile Val Ser Lys Gly Ala Pro Ala Ala Asn Val Thr Ala Val
305                 310                 315                 320

ggt tac ggt gaa gca aac cct gta acc ggc gca aca tgt gac aaa gtt   1008
Gly Tyr Gly Glu Ala Asn Pro Val Thr Gly Ala Thr Cys Asp Lys Val
                325                 330                 335

aaa ggt cgt aaa gca tta atc gct tgc tta gca ccg gat cgt cgt gtt   1056
Lys Gly Arg Lys Ala Leu Ile Ala Cys Leu Ala Pro Asp Arg Arg Val
            340                 345                 350

gaa gtt caa gtt caa ggt act aaa gaa gta act atg taa              1095
Glu Val Gln Val Gln Gly Thr Lys Glu Val Thr Met
        355                 360
```

<210> 151
<211> 364
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 151

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Met Lys Lys Ser Leu Val Ala Leu Thr Val Leu Ser Ala Ala Ala Val
  1               5                  10                  15

Ala Gln Ala Ala Pro Gln Gln Asn Thr Phe Tyr Ala Gly Ala Lys Ala
             20                  25                  30

Gly Trp Ala Ser Phe His Asp Gly Ile Glu Gln Leu Asp Ser Ala Lys
         35                  40                  45

Asn Thr Asp Arg Gly Thr Lys Tyr Gly Ile Asn Arg Asn Ser Val Thr
     50                  55                  60

Tyr Gly Val Phe Gly Gly Tyr Gln Ile Leu Asn Gln Asp Lys Leu Gly
 65                  70                  75                  80

Leu Ala Ala Glu Leu Gly Tyr Asp Tyr Phe Gly Arg Val Arg Gly Ser
                 85                  90                  95

Glu Lys Pro Asn Gly Lys Ala Asp Lys Lys Thr Phe Arg His Ala Ala
            100                 105                 110
```

```
His Gly Ala Thr Ile Ala Leu Lys Pro Ser Tyr Glu Val Leu Pro Asp
        115                 120                 125

Leu Asp Val Tyr Gly Lys Val Gly Ile Ala Leu Val Asn Asn Thr Tyr
    130                 135                 140

Lys Thr Phe Asn Ala Ala Gln Glu Lys Val Lys Thr Arg Arg Phe Gln
145                 150                 155                 160

Ser Ser Leu Ile Leu Gly Ala Gly Val Glu Tyr Ala Ile Leu Pro Glu
                165                 170                 175

Leu Ala Ala Arg Val Glu Tyr Gln Trp Leu Asn Asn Ala Gly Lys Ala
            180                 185                 190

Ser Tyr Ser Thr Leu Asn Arg Met Gly Ala Thr Asp Tyr Arg Ser Asp
        195                 200                 205

Ile Ser Ser Val Ser Ala Gly Leu Ser Tyr Arg Phe Gly Gln Gly Ala
    210                 215                 220

Ala Pro Val Ala Ala Pro Ala Val Glu Thr Lys Asn Phe Ala Phe Ser
225                 230                 235                 240

Ser Asp Val Leu Phe Ala Phe Gly Lys Ser Asn Leu Lys Pro Ala Ala
                245                 250                 255

Ala Thr Ala Leu Asp Ala Met Gln Thr Glu Ile Asn Asn Ala Gly Leu
            260                 265                 270

Ser Asn Ala Ala Ile Gln Val Asn Gly Tyr Thr Asp Arg Ile Gly Lys
        275                 280                 285

Glu Ala Ser Asn Leu Lys Leu Ser Gln Arg Arg Ala Glu Thr Val Ala
    290                 295                 300

Asn Tyr Ile Val Ser Lys Gly Ala Pro Ala Ala Asn Val Thr Ala Val
305                 310                 315                 320

Gly Tyr Gly Glu Ala Asn Pro Val Thr Gly Ala Thr Cys Asp Lys Val
                325                 330                 335

Lys Gly Arg Lys Ala Leu Ile Ala Cys Leu Ala Pro Asp Arg Arg Val
            340                 345                 350

Glu Val Gln Val Gln Gly Thr Lys Glu Val Thr Met
        355                 360
```

<210> 152
<211> 1110
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> Omp5

<220>
<221> CDS
<222> (1)..(1107)

<400> 152

```
atg aaa aaa tca tta gtt gct tta gca gta tta tcg gct gca gca gta   48
Met Lys Lys Ser Leu Val Ala Leu Ala Val Leu Ser Ala Ala Ala Val
  1               5                  10                  15

gct caa gca gct cca caa caa aat act ttc tac gca ggt gcg aaa gtt   96
Ala Gln Ala Ala Pro Gln Gln Asn Thr Phe Tyr Ala Gly Ala Lys Val
             20                  25                  30

ggt caa tca tca ttt cac cac ggt gtt aac caa tta aaa tct ggt cac   144
Gly Gln Ser Ser Phe His His Gly Val Asn Gln Leu Lys Ser Gly His
         35                  40                  45

gat gat cgt tat aat gat aaa aca cgt aag tat ggt atc aac cgt aac   192
Asp Asp Arg Tyr Asn Asp Lys Thr Arg Lys Tyr Gly Ile Asn Arg Asn
     50                  55                  60

tct gta act tac ggt gta ttc ggc ggt tac caa atc tta aac caa aat   240
Ser Val Thr Tyr Gly Val Phe Gly Gly Tyr Gln Ile Leu Asn Gln Asn
 65                  70                  75                  80

aac ttc ggt tta gca gct gaa tta ggc tat gac tac tac ggt cgc gta   288
Asn Phe Gly Leu Ala Ala Glu Leu Gly Tyr Asp Tyr Tyr Gly Arg Val
                 85                  90                  95

cgt ggt aac gta gat gaa ttc cgt aca gtt aaa cac tct gct cac ggt   336
Arg Gly Asn Val Asp Glu Phe Arg Thr Val Lys His Ser Ala His Gly
            100                 105                 110

tta aac tta gcg tta aaa cca agc tac gaa gta tta cct gac tta gac   384
Leu Asn Leu Ala Leu Lys Pro Ser Tyr Glu Val Leu Pro Asp Leu Asp
        115                 120                 125

gtt tac ggt aaa gta ggt att gcg gtt gtt cgt aat gac tat aaa aaa   432
Val Tyr Gly Lys Val Gly Ile Ala Val Val Arg Asn Asp Tyr Lys Lys
    130                 135                 140

tat ggt gcg gaa aac act aac gaa tca aca aca aaa ttc cac aaa tta   480
Tyr Gly Ala Glu Asn Thr Asn Glu Ser Thr Thr Lys Phe His Lys Leu
145                 150                 155                 160

aaa gca tca act att tta ggt gca ggt gtt gag tac gca att ctt cct   528
Lys Ala Ser Thr Ile Leu Gly Ala Gly Val Glu Tyr Ala Ile Leu Pro
                165                 170                 175

gaa tta gcg gca cgt gtt gaa tac caa tac tta aac aaa gcg ggt aac   576
Glu Leu Ala Ala Arg Val Glu Tyr Gln Tyr Leu Asn Lys Ala Gly Asn
            180                 185                 190

tta aat aaa gca tta gtt cgt tca ggc aca caa gat gtg gac ttc caa   624
Leu Asn Lys Ala Leu Val Arg Ser Gly Thr Gln Asp Val Asp Phe Gln
        195                 200                 205


tat gct cct gat atc cac tct gta aca gca ggt tta tca tac cgt ttc   672
Tyr Ala Pro Asp Ile His Ser Val Thr Ala Gly Leu Ser Tyr Arg Phe
    210                 215                 220

ggt caa ggc gct gta gca cca gtt gtt gag cca gaa gtt gta act aaa   720
Gly Gln Gly Ala Val Ala Pro Val Val Glu Pro Glu Val Val Thr Lys
225                 230                 235                 240

aac ttc gca ttc agc tca gac gtt tta ttt gat ttc ggt aaa tca agc   768
Asn Phe Ala Phe Ser Ser Asp Val Leu Phe Asp Phe Gly Lys Ser Ser
```

```
                245                 250                 255

tta aaa cca gca gca gca aca gct tta gac gca gct aac act gaa atc   816
Leu Lys Pro Ala Ala Ala Thr Ala Leu Asp Ala Ala Asn Thr Glu Ile
            260                 265                 270

gct aac tta ggt tta gca act cca gct atc caa gtt aac ggt tat aca   864
Ala Asn Leu Gly Leu Ala Thr Pro Ala Ile Gln Val Asn Gly Tyr Thr
        275                 280                 285

gac cgt atc ggt aaa gaa gct tca aac tta aaa ctt tca caa cgc cgt   912
Asp Arg Ile Gly Lys Glu Ala Ser Asn Leu Lys Leu Ser Gln Arg Arg
    290                 295                 300

gca gaa act gta gct aac tac tta gtt tct aaa ggt caa aac cct gca   960
Ala Glu Thr Val Ala Asn Tyr Leu Val Ser Lys Gly Gln Asn Pro Ala
305                 310                 315                 320

aac gta act gca gta ggt tac ggt gaa gca aac cca gta acc ggc gca  1008
Asn Val Thr Ala Val Gly Tyr Gly Glu Ala Asn Pro Val Thr Gly Ala
                325                 330                 335

aca tgt gat gca gtt aaa ggt cgt aaa gca tta atc gct tgc tta gca  1056
Thr Cys Asp Ala Val Lys Gly Arg Lys Ala Leu Ile Ala Cys Leu Ala
            340                 345                 350

ccg gat cgt cgt gtt gaa gtt caa gta caa ggt gct aaa aac gta gct  1104
Pro Asp Arg Arg Val Glu Val Gln Val Gln Gly Ala Lys Asn Val Ala
        355                 360                 365

atg taa                                                         1110
Met
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<210> 153
<211> 369
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 153

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Met Lys Lys Ser Leu Val Ala Leu Ala Val Leu Ser Ala Ala Ala Val
  1               5                  10                  15

Ala Gln Ala Ala Pro Gln Gln Asn Thr Phe Tyr Ala Gly Ala Lys Val
             20                  25                  30

Gly Gln Ser Ser Phe His His Gly Val Asn Gln Leu Lys Ser Gly His
         35                  40                  45

Asp Asp Arg Tyr Asn Asp Lys Thr Arg Lys Tyr Gly Ile Asn Arg Asn
     50                  55                  60

Ser Val Thr Tyr Gly Val Phe Gly Gly Tyr Gln Ile Leu Asn Gln Asn
 65                  70                  75                  80

Asn Phe Gly Leu Ala Ala Glu Leu Gly Tyr Asp Tyr Tyr Gly Arg Val
                 85                  90                  95

Arg Gly Asn Val Asp Glu Phe Arg Thr Val Lys His Ser Ala His Gly
            100                 105                 110

Leu Asn Leu Ala Leu Lys Pro Ser Tyr Glu Val Leu Pro Asp Leu Asp
        115                 120                 125
```

```
Val Tyr Gly Lys Val Gly Ile Ala Val Val Arg Asn Asp Tyr Lys Lys
    130                 135                 140

Tyr Gly Ala Glu Asn Thr Asn Glu Ser Thr Thr Lys Phe His Lys Leu
145                 150                 155                 160

Lys Ala Ser Thr Ile Leu Gly Ala Gly Val Glu Tyr Ala Ile Leu Pro
                165                 170                 175

Glu Leu Ala Ala Arg Val Glu Tyr Gln Tyr Leu Asn Lys Ala Gly Asn
            180                 185                 190

Leu Asn Lys Ala Leu Val Arg Ser Gly Thr Gln Asp Val Asp Phe Gln
        195                 200                 205

Tyr Ala Pro Asp Ile His Ser Val Thr Ala Gly Leu Ser Tyr Arg Phe
    210                 215                 220

Gly Gln Gly Ala Val Ala Pro Val Val Glu Pro Glu Val Val Thr Lys
225                 230                 235                 240

Asn Phe Ala Phe Ser Ser Asp Val Leu Phe Asp Phe Gly Lys Ser Ser
                245                 250                 255

Leu Lys Pro Ala Ala Ala Thr Ala Leu Asp Ala Ala Asn Thr Glu Ile
            260                 265                 270

Ala Asn Leu Gly Leu Ala Thr Pro Ala Ile Gln Val Asn Gly Tyr Thr
        275                 280                 285

Asp Arg Ile Gly Lys Glu Ala Ser Asn Leu Lys Leu Ser Gln Arg Arg
    290                 295                 300

Ala Glu Thr Val Ala Asn Tyr Leu Val Ser Lys Gly Gln Asn Pro Ala
305                 310                 315                 320

Asn Val Thr Ala Val Gly Tyr Gly Glu Ala Asn Pro Val Thr Gly Ala
                325                 330                 335

Thr Cys Asp Ala Val Lys Gly Arg Lys Ala Leu Ile Ala Cys Leu Ala
            340                 345                 350

Pro Asp Arg Arg Val Glu Val Gln Val Gln Gly Ala Lys Asn Val Ala
        355                 360                 365

Met
```

<210> 154
<211> 1076
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> pnp new

<220>
<221> CDS
<222> (1)..(1074)

<400> 154
aat att aaa gaa ttc gta aaa gaa gcg ggt aaa ccg cgt tgg gat tgg 48

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Asn Ile Lys Glu Phe Val Lys Glu Ala Gly Lys Pro Arg Trp Asp Trp
  1               5                  10                  15

gtt gcg ccg gaa ccg aat acc gca tta atc aac caa gtt aaa gcg tta   96
Val Ala Pro Glu Pro Asn Thr Ala Leu Ile Asn Gln Val Lys Ala Leu
            20                  25                  30

gcg gaa gcg cgt atc ggc gat gcg tat cgt att aca gaa aaa caa gcg   144
Ala Glu Ala Arg Ile Gly Asp Ala Tyr Arg Ile Thr Glu Lys Gln Ala
        35                  40                  45

cgt tac gaa caa atc gat gca att aaa gcg gat gtt atc gca caa tta   192
Arg Tyr Glu Gln Ile Asp Ala Ile Lys Ala Asp Val Ile Ala Gln Leu
    50                  55                  60

acc gca caa gac gaa acc gtt tct gaa ggt gcg att att gat att att   240
Thr Ala Gln Asp Glu Thr Val Ser Glu Gly Ala Ile Ile Asp Ile Ile
65                  70                  75                  80

acc gca tta gaa agt tct att gtt cgc ggt cgt att att gcc ggc gaa   288
Thr Ala Leu Glu Ser Ser Ile Val Arg Gly Arg Ile Ile Ala Gly Glu
                85                  90                  95

ccg cgt att gac ggt cgt acg gta gat acg gtt cgt gca tta gac att   336
Pro Arg Ile Asp Gly Arg Thr Val Asp Thr Val Arg Ala Leu Asp Ile
            100                 105                 110

tgc acc ggc gta tta cct cgt acg cac ggt tct gca atc ttt act cgc   384
Cys Thr Gly Val Leu Pro Arg Thr His Gly Ser Ala Ile Phe Thr Arg
        115                 120                 125

ggt gaa aca caa gca tta gcg gtt gca acc tta ggt act gag cgc gat   432
Gly Glu Thr Gln Ala Leu Ala Val Ala Thr Leu Gly Thr Glu Arg Asp
    130                 135                 140

gca caa att gtt gac gaa tta acc ggc gag aaa tca gac cgt ttc tta   480
Ala Gln Ile Val Asp Glu Leu Thr Gly Glu Lys Ser Asp Arg Phe Leu
145                 150                 155                 160

ttc cac tat aac ttc cct ccg tac tct gtc ggt gaa acc ggt cgt atc   528
Phe His Tyr Asn Phe Pro Pro Tyr Ser Val Gly Glu Thr Gly Arg Ile
                165                 170                 175

ggt tcg ccg aaa cgt cgt gaa atc ggc cac ggt cgt tta gcg aaa cgc   576
Gly Ser Pro Lys Arg Arg Glu Ile Gly His Gly Arg Leu Ala Lys Arg
            180                 185                 190

ggt gta tta gcg gta atg ccg act gct gaa gaa ttc ccg tat gta gtg   624
Gly Val Leu Ala Val Met Pro Thr Ala Glu Glu Phe Pro Tyr Val Val
        195                 200                 205

cgc gta gta tct gaa att acc gaa tca aac ggt tct tct tca atg gct   672
Arg Val Val Ser Glu Ile Thr Glu Ser Asn Gly Ser Ser Ser Met Ala
    210                 215                 220

tcc gta tgc ggc gca tct tta gcg tta atg gac gca ggc gta ccg att   720
Ser Val Cys Gly Ala Ser Leu Ala Leu Met Asp Ala Gly Val Pro Ile
225                 230                 235                 240

aaa gcg gcg gtt gcg ggt atc gca atg ggc tta gtg aaa gaa gaa gaa   768
Lys Ala Ala Val Ala Gly Ile Ala Met Gly Leu Val Lys Glu Glu Glu
                245                 250                 255
```

```
aaa ttt gtg gtg ctt tca gac atc tta ggt gac gaa gac cat tta ggc   816
Lys Phe Val Val Leu Ser Asp Ile Leu Gly Asp Glu Asp His Leu Gly
            260                 265                 270

gat atg gac ttc aaa gta gcc ggt acg cgt gaa ggt gta acc gca ctt   864
Asp Met Asp Phe Lys Val Ala Gly Thr Arg Glu Gly Val Thr Ala Leu
        275                 280                 285

caa atg gat att aaa atc gaa ggt atc acg cct gaa att atg caa atc   912
Gln Met Asp Ile Lys Ile Glu Gly Ile Thr Pro Glu Ile Met Gln Ile
    290                 295                 300

gca tta aat caa gcg aaa ggt gcg cgt atg cac atc tta agc gtg atg   960
Ala Leu Asn Gln Ala Lys Gly Ala Arg Met His Ile Leu Ser Val Met
305                 310                 315                 320

gaa caa gcg att cct gca cct cgt gcc gat att tcc gat ttt gcg cct  1008
Glu Gln Ala Ile Pro Ala Pro Arg Ala Asp Ile Ser Asp Phe Ala Pro
                325                 330                 335

cgt att cat acg atg aag atc gat ccg aag aaa atc aaa gac gtg atc  1056
Arg Ile His Thr Met Lys Ile Asp Pro Lys Lys Ile Lys Asp Val Ile
            340                 345                 350

ggt aaa ggc ggt gcg gtt at                                      1076
Gly Lys Gly Gly Ala Val
        355
```

<210> 155
<211> 358
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 155

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Asn Ile Lys Glu Phe Val Lys Glu Ala Gly Lys Pro Arg Trp Asp Trp
  1               5                  10                  15

Val Ala Pro Glu Pro Asn Thr Ala Leu Ile Asn Gln Val Lys Ala Leu
            20                  25                  30

Ala Glu Ala Arg Ile Gly Asp Ala Tyr Arg Ile Thr Glu Lys Gln Ala
        35                  40                  45

Arg Tyr Glu Gln Ile Asp Ala Ile Lys Ala Asp Val Ile Ala Gln Leu
    50                  55                  60

Thr Ala Gln Asp Glu Thr Val Ser Glu Gly Ala Ile Ile Asp Ile Ile
65                  70                  75                  80

Thr Ala Leu Glu Ser Ser Ile Val Arg Gly Arg Ile Ile Ala Gly Glu
                85                  90                  95

Pro Arg Ile Asp Gly Arg Thr Val Asp Thr Val Arg Ala Leu Asp Ile
            100                 105                 110

Cys Thr Gly Val Leu Pro Arg Thr His Gly Ser Ala Ile Phe Thr Arg
        115                 120                 125

Gly Glu Thr Gln Ala Leu Ala Val Ala Thr Leu Gly Thr Glu Arg Asp
    130                 135                 140
```

```
Ala Gln Ile Val Asp Glu Leu Thr Gly Glu Lys Ser Asp Arg Phe Leu
145                 150                 155                 160

Phe His Tyr Asn Phe Pro Pro Tyr Ser Val Gly Glu Thr Gly Arg Ile
                165                 170                 175

Gly Ser Pro Lys Arg Arg Glu Ile Gly His Gly Arg Leu Ala Lys Arg
            180                 185                 190

Gly Val Leu Ala Val Met Pro Thr Ala Glu Glu Phe Pro Tyr Val Val
        195                 200                 205

Arg Val Val Ser Glu Ile Thr Glu Ser Asn Gly Ser Ser Ser Met Ala
    210                 215                 220

Ser Val Cys Gly Ala Ser Leu Ala Leu Met Asp Ala Gly Val Pro Ile
225                 230                 235                 240

Lys Ala Ala Val Ala Gly Ile Ala Met Gly Leu Val Lys Glu Glu Glu
                245                 250                 255

Lys Phe Val Val Leu Ser Asp Ile Leu Gly Asp Glu Asp His Leu Gly
            260                 265                 270

Asp Met Asp Phe Lys Val Ala Gly Thr Arg Glu Gly Val Thr Ala Leu
        275                 280                 285

Gln Met Asp Ile Lys Ile Glu Gly Ile Thr Pro Glu Ile Met Gln Ile
    290                 295                 300

Ala Leu Asn Gln Ala Lys Gly Ala Arg Met His Ile Leu Ser Val Met
305                 310                 315                 320

Glu Gln Ala Ile Pro Ala Pro Arg Ala Asp Ile Ser Asp Phe Ala Pro
                325                 330                 335

Arg Ile His Thr Met Lys Ile Asp Pro Lys Lys Ile Lys Asp Val Ile
            340                 345                 350

Gly Lys Gly Gly Ala Val
        355
```

<210> 156
<211> 1055
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> potD

<220>
<221> CDS
<222> (1)..(1053)

<400> 156

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atg aaa aaa tta gcg ggt tta ttt gca gca ggt tta gcg aca gtt gca   48
Met Lys Lys Leu Ala Gly Leu Phe Ala Ala Gly Leu Ala Thr Val Ala
  1               5                  10                  15

tta aca gcg tgt aat gaa gaa aag cca aaa gcg gct gaa gca gcg gct   96
Leu Thr Ala Cys Asn Glu Glu Lys Pro Lys Ala Ala Glu Ala Ala Ala
             20                  25                  30
```

```
caa ccg gca gca gcg gga aca gtt cac ctt tat act tgg act gaa tat   144
Gln Pro Ala Ala Ala Gly Thr Val His Leu Tyr Thr Trp Thr Glu Tyr
         35                  40                  45

gtg cct gaa ggc ttg tta gat gaa ttt aca aag caa acc ggt atc aaa   192
Val Pro Glu Gly Leu Leu Asp Glu Phe Thr Lys Gln Thr Gly Ile Lys
     50                  55                  60

gta gag gtt tca agc ctt gaa tct aac gaa acc atg tat gcg aaa tta   240
Val Glu Val Ser Ser Leu Glu Ser Asn Glu Thr Met Tyr Ala Lys Leu
 65                  70                  75                  80

aaa tta caa ggt aaa gac ggc ggt tac gat gtt atc gca cct tct aac   288
Lys Leu Gln Gly Lys Asp Gly Gly Tyr Asp Val Ile Ala Pro Ser Asn
                 85                  90                  95

tac ttc gtt tca aaa atg gcg aaa gaa ggt atg tta gcg gaa tta gat   336
Tyr Phe Val Ser Lys Met Ala Lys Glu Gly Met Leu Ala Glu Leu Asp
            100                 105                 110

cac gca aaa ctt cct gta atc aaa gag tta aac caa gat tgg tta aac   384
His Ala Lys Leu Pro Val Ile Lys Glu Leu Asn Gln Asp Trp Leu Asn
        115                 120                 125

aaa cct tat gac caa ggt aac aaa tac tct tta ccg caa tta tta ggt   432
Lys Pro Tyr Asp Gln Gly Asn Lys Tyr Ser Leu Pro Gln Leu Leu Gly
    130                 135                 140

gca ccg ggt atc gca ttt aac tca aat gac tat aag ggc gat gcg ttc   480
Ala Pro Gly Ile Ala Phe Asn Ser Asn Asp Tyr Lys Gly Asp Ala Phe
145                 150                 155                 160

act tct tgg ggt gat tta tgg aaa cct gag ttt gcg aat aaa gta caa   528
Thr Ser Trp Gly Asp Leu Trp Lys Pro Glu Phe Ala Asn Lys Val Gln
                165                 170                 175

tta tta gat gac gca cgt gaa gta ttt aac att gcg tta tta aaa tta   576
Leu Leu Asp Asp Ala Arg Glu Val Phe Asn Ile Ala Leu Leu Lys Leu
            180                 185                 190

ggt aaa aac cct aat aca acc aat ccg gaa gag att aaa gcg gct tac   624
Gly Lys Asn Pro Asn Thr Thr Asn Pro Glu Glu Ile Lys Ala Ala Tyr
        195                 200                 205

gaa gag tta aga aaa tta cgt cca aac gta ctt tct ttc act tca gac   672
Glu Glu Leu Arg Lys Leu Arg Pro Asn Val Leu Ser Phe Thr Ser Asp
    210                 215                 220

aac cca gcg aac tca ttt atc gca ggt gaa gta tct gta ggt caa tta   720
Asn Pro Ala Asn Ser Phe Ile Ala Gly Glu Val Ser Val Gly Gln Leu
225                 230                 235                 240

tgg aac ggt tct gta cgt att gcg aaa aaa gaa caa gcg ccg gta aac   768
Trp Asn Gly Ser Val Arg Ile Ala Lys Lys Glu Gln Ala Pro Val Asn
                245                 250                 255

atg gtg ttc cca aaa gaa ggt cct gta ctt tgg gtt gat acg tta gcc   816
Met Val Phe Pro Lys Glu Gly Pro Val Leu Trp Val Asp Thr Leu Ala
            260                 265                 270

att ccg gcg aat gcg aaa aac aaa gaa aat gcg cat aag tta atc aac   864
Ile Pro Ala Asn Ala Lys Asn Lys Glu Asn Ala His Lys Leu Ile Asn
        275                 280                 285
```

```
tac tta tta agc gca ccg gtt gcg gaa aaa tta acg tta gaa atc ggt   912
Tyr Leu Leu Ser Ala Pro Val Ala Glu Lys Leu Thr Leu Glu Ile Gly
    290                 295                 300

tat ccg act tca aac gta gaa gcg tta aaa aca tta cca aaa gag att   960
Tyr Pro Thr Ser Asn Val Glu Ala Leu Lys Thr Leu Pro Lys Glu Ile
305                 310                 315                 320

acc gaa gat ccg gca atc tat ccg aca gct gat gtg tta aaa gcg gca   1008
Thr Glu Asp Pro Ala Ile Tyr Pro Thr Ala Asp Val Leu Lys Ala Ala
                325                 330                 335

caa tgg caa gac gat gta ggt aat gca atc gaa ctt tac gaa aaa ta    1055
Gln Trp Gln Asp Asp Val Gly Asn Ala Ile Glu Leu Tyr Glu Lys
            340                 345                 350
```

<210> 157
<211> 351
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 157

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Met Lys Lys Leu Ala Gly Leu Phe Ala Ala Gly Leu Ala Thr Val Ala
  1               5                  10                  15

Leu Thr Ala Cys Asn Glu Glu Lys Pro Lys Ala Ala Glu Ala Ala Ala
            20                  25                  30

Gln Pro Ala Ala Ala Gly Thr Val His Leu Tyr Thr Trp Thr Glu Tyr
        35                  40                  45

Val Pro Glu Gly Leu Leu Asp Glu Phe Thr Lys Gln Thr Gly Ile Lys
    50                  55                  60

Val Glu Val Ser Ser Leu Glu Ser Asn Glu Thr Met Tyr Ala Lys Leu
65                  70                  75                  80

Lys Leu Gln Gly Lys Asp Gly Gly Tyr Asp Val Ile Ala Pro Ser Asn
                85                  90                  95

Tyr Phe Val Ser Lys Met Ala Lys Glu Gly Met Leu Ala Glu Leu Asp
            100                 105                 110

His Ala Lys Leu Pro Val Ile Lys Glu Leu Asn Gln Asp Trp Leu Asn
        115                 120                 125

Lys Pro Tyr Asp Gln Gly Asn Lys Tyr Ser Leu Pro Gln Leu Leu Gly
    130                 135                 140

Ala Pro Gly Ile Ala Phe Asn Ser Asn Asp Tyr Lys Gly Asp Ala Phe
145                 150                 155                 160

Thr Ser Trp Gly Asp Leu Trp Lys Pro Glu Phe Ala Asn Lys Val Gln
                165                 170                 175

Leu Leu Asp Asp Ala Arg Glu Val Phe Asn Ile Ala Leu Leu Lys Leu
            180                 185                 190

Gly Lys Asn Pro Asn Thr Thr Asn Pro Glu Glu Ile Lys Ala Ala Tyr
        195                 200                 205

Glu Glu Leu Arg Lys Leu Arg Pro Asn Val Leu Ser Phe Thr Ser Asp
```

```
    210                 215                 220

Asn Pro Ala Asn Ser Phe Ile Ala Gly Glu Val Ser Val Gly Gln Leu
225                 230                 235                 240

Trp Asn Gly Ser Val Arg Ile Ala Lys Lys Glu Gln Ala Pro Val Asn
                245                 250                 255

Met Val Phe Pro Lys Glu Gly Pro Val Leu Trp Val Asp Thr Leu Ala
            260                 265                 270

Ile Pro Ala Asn Ala Lys Asn Lys Glu Asn Ala His Lys Leu Ile Asn
        275                 280                 285

Tyr Leu Leu Ser Ala Pro Val Ala Glu Lys Leu Thr Leu Glu Ile Gly
    290                 295                 300

Tyr Pro Thr Ser Asn Val Glu Ala Leu Lys Thr Leu Pro Lys Glu Ile
305                 310                 315                 320

Thr Glu Asp Pro Ala Ile Tyr Pro Thr Ala Asp Val Leu Lys Ala Ala
                325                 330                 335

Gln Trp Gln Asp Asp Val Gly Asn Ala Ile Glu Leu Tyr Glu Lys
            340                 345                 350
```

<210> 158
<211> 525
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> rpmF

<220>
<221> CDS
<222> (1)..(522)

<400> 158

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atg caa aag gta aaa cta ccc ctc acc att gac cca tat aaa gac gct   48
Met Gln Lys Val Lys Leu Pro Leu Thr Ile Asp Pro Tyr Lys Asp Ala
  1               5                  10                  15

cag cgt cga atg gat tac gaa ggc tac atc tca cgt agt ctg ctt aat   96
Gln Arg Arg Met Asp Tyr Glu Gly Tyr Ile Ser Arg Ser Leu Leu Asn
             20                  25                  30

cgt ttg ggt gaa tct gtg agc aat gtg cta agc gat gca caa gtt act   144
Arg Leu Gly Glu Ser Val Ser Asn Val Leu Ser Asp Ala Gln Val Thr
         35                  40                  45

ctc tcg tta tat atc gat ccg caa cgc tta acc gtt att aaa ggt acg   192
Leu Ser Leu Tyr Ile Asp Pro Gln Arg Leu Thr Val Ile Lys Gly Thr
     50                  55                  60

gcg aca gtg gaa gtg gaa ttc gat tgc caa cga tgc ggt aac ccg ttt   240
Ala Thr Val Glu Val Glu Phe Asp Cys Gln Arg Cys Gly Asn Pro Phe
 65                  70                  75                  80

aca caa acg ctt gac tgt tcg ttt tgt ttc agt ccg gtg tcc aat atg   288
Thr Gln Thr Leu Asp Cys Ser Phe Cys Phe Ser Pro Val Ser Asn Met
```

```
                85                  90                  95

gat cag gcg gac aat ttg ccc gaa att tat gaa cca atc gaa gta aac   336
Asp Gln Ala Asp Asn Leu Pro Glu Ile Tyr Glu Pro Ile Glu Val Asn
            100                 105                 110

gag ttc ggt gaa gta aat tta cta gat atg atc gaa gat gga ttt atc   384
Glu Phe Gly Glu Val Asn Leu Leu Asp Met Ile Glu Asp Gly Phe Ile
        115                 120                 125

atc gaa ttg cct cta gtc ccg atg cat agt gaa gaa cac tgt gaa gtg   432
Ile Glu Leu Pro Leu Val Pro Met His Ser Glu Glu His Cys Glu Val
    130                 135                 140

tcc gtg agt gaa cag gtg ttt ggc gaa ttg cct gaa gaa ttg gcg aaa   480
Ser Val Ser Glu Gln Val Phe Gly Glu Leu Pro Glu Glu Leu Ala Lys
145                 150                 155                 160

aaa cct aac ccg ttc gct gta tta gct aat tta aag aaa aac tag       525
Lys Pro Asn Pro Phe Ala Val Leu Ala Asn Leu Lys Lys Asn
                165                 170
```

<210> 159
<211> 174
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 159

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Met Gln Lys Val Lys Leu Pro Leu Thr Ile Asp Pro Tyr Lys Asp Ala
  1               5                  10                  15

Gln Arg Arg Met Asp Tyr Glu Gly Tyr Ile Ser Arg Ser Leu Leu Asn
             20                  25                  30

Arg Leu Gly Glu Ser Val Ser Asn Val Leu Ser Asp Ala Gln Val Thr
         35                  40                  45

Leu Ser Leu Tyr Ile Asp Pro Gln Arg Leu Thr Val Ile Lys Gly Thr
     50                  55                  60

Ala Thr Val Glu Val Glu Phe Asp Cys Gln Arg Cys Gly Asn Pro Phe
 65                  70                  75                  80

Thr Gln Thr Leu Asp Cys Ser Phe Cys Phe Ser Pro Val Ser Asn Met
                85                  90                  95

Asp Gln Ala Asp Asn Leu Pro Glu Ile Tyr Glu Pro Ile Glu Val Asn
            100                 105                 110

Glu Phe Gly Glu Val Asn Leu Leu Asp Met Ile Glu Asp Gly Phe Ile
        115                 120                 125

Ile Glu Leu Pro Leu Val Pro Met His Ser Glu Glu His Cys Glu Val
    130                 135                 140

Ser Val Ser Glu Gln Val Phe Gly Glu Leu Pro Glu Glu Leu Ala Lys
145                 150                 155                 160

Lys Pro Asn Pro Phe Ala Val Leu Ala Asn Leu Lys Lys Asn
                165                 170
```

<210> 160
<211> 1302
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> tig

<220>
<221> CDS
<222> (1)..(1299)

<400> 160
```
atg tca att tct att gaa act tta gaa ggc tta caa cgc cgc gta act   48
Met Ser Ile Ser Ile Glu Thr Leu Glu Gly Leu Gln Arg Arg Val Thr
  1               5                  10                  15

att acc gta gct gct gat aaa atc gaa gcg gct tac aaa gag caa tta   96
Ile Thr Val Ala Ala Asp Lys Ile Glu Ala Ala Tyr Lys Glu Gln Leu
             20                  25                  30

aaa ggc tat gcg aaa aac gct cgt gta gac ggt ttc cgt aaa ggt aaa   144
Lys Gly Tyr Ala Lys Asn Ala Arg Val Asp Gly Phe Arg Lys Gly Lys
         35                  40                  45

gta ccg cac gca att atc gaa caa cgt ttc ggt tta gcg gct cgc caa   192
Val Pro His Ala Ile Ile Glu Gln Arg Phe Gly Leu Ala Ala Arg Gln
     50                  55                  60

gac gta tta tcc gat gaa atg caa cgt gcg ttc ttt gat gcg gta atc   240
Asp Val Leu Ser Asp Glu Met Gln Arg Ala Phe Phe Asp Ala Val Ile
 65                  70                  75                  80

gct gag aaa att aac ctt gcc ggt cgt cct acc ttc aca ccg aac aac   288
Ala Glu Lys Ile Asn Leu Ala Gly Arg Pro Thr Phe Thr Pro Asn Asn
                 85                  90                  95

tac caa ccg agt caa gaa ttc agc ttc act gca act ttt gaa gta ttc   336
Tyr Gln Pro Ser Gln Glu Phe Ser Phe Thr Ala Thr Phe Glu Val Phe
            100                 105                 110

ccg gaa gtt gaa tta aaa ggc tta gaa aat atc gaa gtt gaa aaa ccg   384
Pro Glu Val Glu Leu Lys Gly Leu Glu Asn Ile Glu Val Glu Lys Pro
        115                 120                 125

gtt gta gaa atc aca gaa gct gat tta gac aaa atg atc gat gtg tta   432
Val Val Glu Ile Thr Glu Ala Asp Leu Asp Lys Met Ile Asp Val Leu
    130                 135                 140

cgt aaa caa caa gcg act tgg gct gaa tct caa gca gcg gca caa gcg   480
Arg Lys Gln Gln Ala Thr Trp Ala Glu Ser Gln Ala Ala Ala Gln Ala
145                 150                 155                 160

gaa gac cgt gtt gta atc gac ttc gta ggt tct gta gac ggt gaa gag   528
Glu Asp Arg Val Val Ile Asp Phe Val Gly Ser Val Asp Gly Glu Glu
                165                 170                 175

ttt gaa ggc ggt aaa gcg aca gac ttc act tta gca atg ggt caa agt   576
Phe Glu Gly Gly Lys Ala Thr Asp Phe Thr Leu Ala Met Gly Gln Ser
            180                 185                 190

cgt atg atc cct ggt ttt gaa gaa ggt atc gtt ggt cac aaa gcc ggc   624
Arg Met Ile Pro Gly Phe Glu Glu Gly Ile Val Gly His Lys Ala Gly
```

```
        195                 200                 205

gaa caa ttc gat atc gat gtt act ttc cct gaa gaa tac cac gct gaa   672
Glu Gln Phe Asp Ile Asp Val Thr Phe Pro Glu Glu Tyr His Ala Glu
    210                 215                 220

aac tta aaa ggt aaa gcg gcg aaa ttc gca att aca ctt aag aaa gta   720
Asn Leu Lys Gly Lys Ala Ala Lys Phe Ala Ile Thr Leu Lys Lys Val
225                 230                 235                 240

gaa aat atc gta tta cct gaa tta acc gaa gaa ttc gtg aaa aaa ttc   768
Glu Asn Ile Val Leu Pro Glu Leu Thr Glu Glu Phe Val Lys Lys Phe
                245                 250                 255

ggt tca gca aaa act gta gaa gat tta cgt gcg gaa att aag aaa aat   816
Gly Ser Ala Lys Thr Val Glu Asp Leu Arg Ala Glu Ile Lys Lys Asn
            260                 265                 270

atg caa cgt gaa ctt aaa aac gca gta acc gca cgc gtt aaa aac caa   864
Met Gln Arg Glu Leu Lys Asn Ala Val Thr Ala Arg Val Lys Asn Gln
        275                 280                 285

gta atc aac ggt tta atc gca caa aat gaa att gaa gtg ccg gct gca   912
Val Ile Asn Gly Leu Ile Ala Gln Asn Glu Ile Glu Val Pro Ala Ala
    290                 295                 300

gcg gta gcg gaa gaa gtg gac gta tta cgt cgt caa gcg gtt caa cgt   960
Ala Val Ala Glu Glu Val Asp Val Leu Arg Arg Gln Ala Val Gln Arg
305                 310                 315                 320

ttc ggt ggt aaa ccg gaa atg gct gca caa tta ccg gcg gaa tta ttc  1008
Phe Gly Gly Lys Pro Glu Met Ala Ala Gln Leu Pro Ala Glu Leu Phe
                325                 330                 335

gaa gcg gat gca aaa cgt cgt gtt caa gta ggt tta tta ctt tca acc  1056
Glu Ala Asp Ala Lys Arg Arg Val Gln Val Gly Leu Leu Leu Ser Thr
            340                 345                 350

gta atc ggt act aac gaa tta aaa gtt gat gaa aaa cgt gtt gaa gaa  1104
Val Ile Gly Thr Asn Glu Leu Lys Val Asp Glu Lys Arg Val Glu Glu
        355                 360                 365

acg att gca gaa atc gct tca gct tac gaa caa ccg gcg gaa gtt gtt  1152
Thr Ile Ala Glu Ile Ala Ser Ala Tyr Glu Gln Pro Ala Glu Val Val
    370                 375                 380

gct cat tat gcg aaa aac cgt caa tta acc gaa aat atc cgt aac gta  1200
Ala His Tyr Ala Lys Asn Arg Gln Leu Thr Glu Asn Ile Arg Asn Val
385                 390                 395                 400

gtg tta gaa gag caa gcg gtt gaa gtt gta ctt gcg aaa gca aaa gta  1248
Val Leu Glu Glu Gln Ala Val Glu Val Val Leu Ala Lys Ala Lys Val
                405                 410                 415

act gaa aaa gcg act tct ttt gat gaa gta atg gct caa caa gct caa  1296
Thr Glu Lys Ala Thr Ser Phe Asp Glu Val Met Ala Gln Gln Ala Gln
            420                 425                 430

ggc taa                                                         1302
Gly
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<210> 161
<211> 433
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 161
Met Ser Ile Ser Ile Glu Thr Leu Glu Gly Leu Gln Arg Arg Val Thr
1 5 10 15

Ile Thr Val Ala Ala Asp Lys Ile Glu Ala Ala Tyr Lys Glu Gln Leu
20 25 30

Lys Gly Tyr Ala Lys Asn Ala Arg Val Asp Gly Phe Arg Lys Gly Lys
35 40 45

Val Pro His Ala Ile Ile Glu Gln Arg Phe Gly Leu Ala Ala Arg Gln
50 55 60

Asp Val Leu Ser Asp Glu Met Gln Arg Ala Phe Phe Asp Ala Val Ile
65 70 75 80

Ala Glu Lys Ile Asn Leu Ala Gly Arg Pro Thr Phe Thr Pro Asn Asn
85 90 95

Tyr Gln Pro Ser Gln Glu Phe Ser Phe Thr Ala Thr Phe Glu Val Phe
100 105 110

Pro Glu Val Glu Leu Lys Gly Leu Glu Asn Ile Glu Val Glu Lys Pro
115 120 125

Val Val Glu Ile Thr Glu Ala Asp Leu Asp Lys Met Ile Asp Val Leu
130 135 140

Arg Lys Gln Gln Ala Thr Trp Ala Glu Ser Gln Ala Ala Ala Gln Ala
145 150 155 160

Glu Asp Arg Val Val Ile Asp Phe Val Gly Ser Val Asp Gly Glu Glu
165 170 175

Phe Glu Gly Gly Lys Ala Thr Asp Phe Thr Leu Ala Met Gly Gln Ser
180 185 190

Arg Met Ile Pro Gly Phe Glu Glu Gly Ile Val Gly His Lys Ala Gly
195 200 205

Glu Gln Phe Asp Ile Asp Val Thr Phe Pro Glu Glu Tyr His Ala Glu
210 215 220

Asn Leu Lys Gly Lys Ala Ala Lys Phe Ala Ile Thr Leu Lys Lys Val
225 230 235 240

Glu Asn Ile Val Leu Pro Glu Leu Thr Glu Glu Phe Val Lys Lys Phe
245 250 255

Gly Ser Ala Lys Thr Val Glu Asp Leu Arg Ala Glu Ile Lys Lys Asn
260 265 270

Met Gln Arg Glu Leu Lys Asn Ala Val Thr Ala Arg Val Lys Asn Gln
275 280 285

Val Ile Asn Gly Leu Ile Ala Gln Asn Glu Ile Glu Val Pro Ala Ala
290 295 300

```
Ala Val Ala Glu Glu Val Asp Val Leu Arg Arg Gln Ala Val Gln Arg
305                 310                 315                 320

Phe Gly Gly Lys Pro Glu Met Ala Ala Gln Leu Pro Ala Glu Leu Phe
                325                 330                 335

Glu Ala Asp Ala Lys Arg Arg Val Gln Val Gly Leu Leu Leu Ser Thr
            340                 345                 350

Val Ile Gly Thr Asn Glu Leu Lys Val Asp Glu Lys Arg Val Glu Glu
        355                 360                 365

Thr Ile Ala Glu Ile Ala Ser Ala Tyr Glu Gln Pro Ala Glu Val Val
    370                 375                 380

Ala His Tyr Ala Lys Asn Arg Gln Leu Thr Glu Asn Ile Arg Asn Val
385                 390                 395                 400

Val Leu Glu Glu Gln Ala Val Glu Val Val Leu Ala Lys Ala Lys Val
                405                 410                 415

Thr Glu Lys Ala Thr Ser Phe Asp Glu Val Met Ala Gln Gln Ala Gln
            420                 425                 430

Gly
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<210> 162
<211> 316
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> tRNA-glu

<400> 162
aatattgcgc tcaaatggca aagcggagag catctttaaa tgttgtcccc atcgtctaga 60

ggcctaggac atcgcccttt cacggcggta accggggttc gaatccccgt ggggacgcca 120

tttaaagatg acttttgttg tctgaattgt tctttaaaaa attggaaaca agctgaaaac 180

tgagagattt tcgaaagaaa gtctgagtag taaaagataa gtaattatct tgaaaatctt 240

agctgaacaa aagcagctaa gtgtttagtt gaataaagta tcgcgttgaa tgcgttcaaa 300

taaaatttga aaatat 316

<210> 163
<211> 85
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> tRNA-leu

<400> 163
gctctggtgg tggaattggt agacacgcta tcttgagggg gtagtgtcca taggatgtgc 60

gagttcgagt ctcgcccaga gcacc 85

<210> 164
<211> 623
<212> DNA
<213> Actinobacillus pleuropneumoniae

<220>
<223> yaeE

<220>
<221> CDS
<222> (1)..(621)

<400> 164

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atg caa gaa ctc aca cct caa atg tgg ggc tta gtc ggc act tca acg   48
Met Gln Glu Leu Thr Pro Gln Met Trp Gly Leu Val Gly Thr Ser Thr
  1               5                  10                  15

ctt gaa acg ctc tat atg ggc ttt gcg gcg act tta ctt gct gtg gta   96
Leu Glu Thr Leu Tyr Met Gly Phe Ala Ala Thr Leu Leu Ala Val Val
             20                  25                  30

gtc ggt ttg ccg atc ggt ttt ctg gca ttt tta acc ggt aaa gga gag   144
Val Gly Leu Pro Ile Gly Phe Leu Ala Phe Leu Thr Gly Lys Gly Glu
         35                  40                  45

att tta gag aat ccg cgt tta cat caa gta tta gat gtg att att aat   192
Ile Leu Glu Asn Pro Arg Leu His Gln Val Leu Asp Val Ile Ile Asn
     50                  55                  60

atc ggt cgt tcc gta ccg ttt att att ttg tta gtc gtg ttg tta cct   240
Ile Gly Arg Ser Val Pro Phe Ile Ile Leu Leu Val Val Leu Leu Pro
 65                  70                  75                  80

ttt acg cgt tta ttg gtc ggg aca acg ctc ggt act acg gcg gcg att   288
Phe Thr Arg Leu Leu Val Gly Thr Thr Leu Gly Thr Thr Ala Ala Ile
                 85                  90                  95

gtg ccg tta agc gtt tcg gca att ccg ttt ttt gcg cgt tta act tca   336
Val Pro Leu Ser Val Ser Ala Ile Pro Phe Phe Ala Arg Leu Thr Ser
            100                 105                 110

aat gcg tta tta gaa atc cca gca ggt tta acc gaa gcg gcg aaa tcg   384
Asn Ala Leu Leu Glu Ile Pro Ala Gly Leu Thr Glu Ala Ala Lys Ser
        115                 120                 125

atg ggc gca acg aat tgg caa gtg gtc agt aaa ttt tat tta ccg gaa   432
Met Gly Ala Thr Asn Trp Gln Val Val Ser Lys Phe Tyr Leu Pro Glu
    130                 135                 140

tca ctg ccg att tta atc aat ggt atc aca tta act tta gtc gct tta   480
Ser Leu Pro Ile Leu Ile Asn Gly Ile Thr Leu Thr Leu Val Ala Leu
145                 150                 155                 160

atc ggt tat tcg gca atg gcg ggt gcg gtc ggc ggc ggc ggt ttg ggt   528
Ile Gly Tyr Ser Ala Met Ala Gly Ala Val Gly Gly Gly Gly Leu Gly
                165                 170                 175

aac ctt gcc atc agt tac ggt gaa cac cga aat atg gtc tat gta aaa   576
Asn Leu Ala Ile Ser Tyr Gly Glu His Arg Asn Met Val Tyr Val Lys
            180                 185                 190

tgg atc tca aca att att atc gta gcg att gtg atg atc agt caa aa    623
Trp Ile Ser Thr Ile Ile Ile Val Ala Ile Val Met Ile Ser Gln
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Leu Glu Thr Leu Tyr Met Gly Phe Ala Ala Thr Leu Leu Ala Val Val
20 25 30

Val Gly Leu Pro Ile Gly Phe Leu Ala Phe Leu Thr Gly Lys Gly Glu
35 40 45

Ile Leu Glu Asn Pro Arg Leu His Gln Val Leu Asp Val Ile Ile Asn
50 55 60

Ile Gly Arg Ser Val Pro Phe Ile Ile Leu Leu Val Val Leu Leu Pro
65 70 75 80

Phe Thr Arg Leu Leu Val Gly Thr Thr Leu Gly Thr Thr Ala Ala Ile
85 90 95

Val Pro Leu Ser Val Ser Ala Ile Pro Phe Phe Ala Arg Leu Thr Ser
100 105 110

Asn Ala Leu Leu Glu Ile Pro Ala Gly Leu Thr Glu Ala Ala Lys Ser
115 120 125

Met Gly Ala Thr Asn Trp Gln Val Val Ser Lys Phe Tyr Leu Pro Glu
130 135 140

Ser Leu Pro Ile Leu Ile Asn Gly Ile Thr Leu Thr Leu Val Ala Leu
145 150 155 160

Ile Gly Tyr Ser Ala Met Ala Gly Ala Val Gly Gly Gly Gly Leu Gly
165 170 175

Asn Leu Ala Ile Ser Tyr Gly Glu His Arg Asn Met Val Tyr Val Lys
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Trp Ile Ser Thr Ile Ile Ile Val Ala Ile Val Met Ile Ser Gln
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Ala Leu Ile Val Pro
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